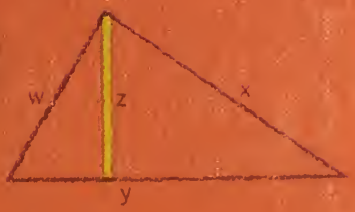

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Seeing through arithmetic

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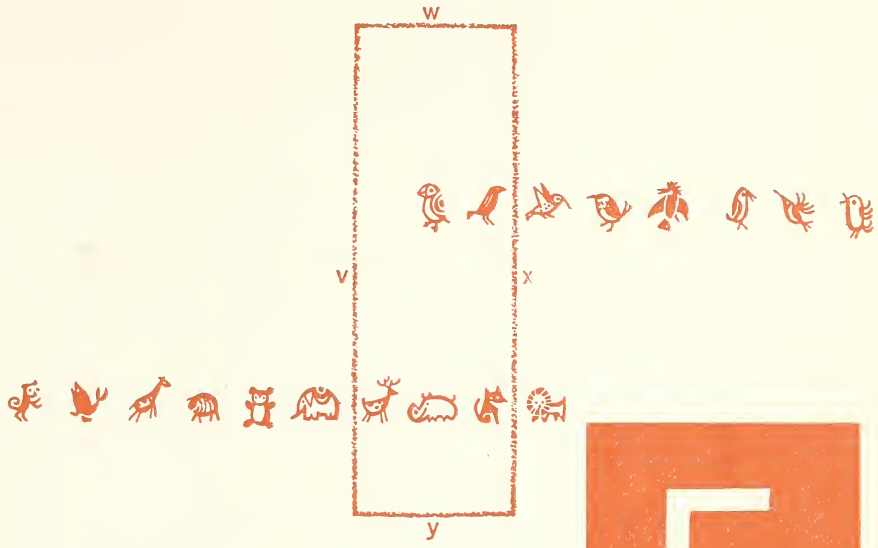


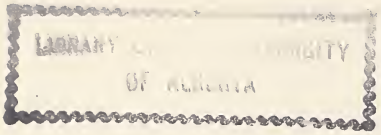
Seeing through arithmetic

5

by Maurice L. Hartung, Henry Van Engen,
and Lois Knowles

Scott, Foresman and Company

Chicago, Atlanta, Dallas, Palo Alto, Fair Lawn, N. J.



This is the fifth book of The Basic Mathematics Program,
which is a unit of THE CURRICULUM FOUNDATION SERIES®,
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The authors of this book are Maurice L. Hartung,
Professor of Education, University of Chicago;
Henry Van Engen, Head of the Department of Mathematics,
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A collaborator in the preparation of this book is R. A. Rennie,
Associate Professor of Psychology, University of Saskatchewan.

This book was prepared by the editorial staff under the direction of
George E. Russell, Directing Editor of The Basic Mathematics Program.

This book was designed by William Nicoll
and illustrated by Janet LaSalle with the assistance of others.

The Table of Contents, Index, and information concerning the vocabulary
are on pages 268 to 272.

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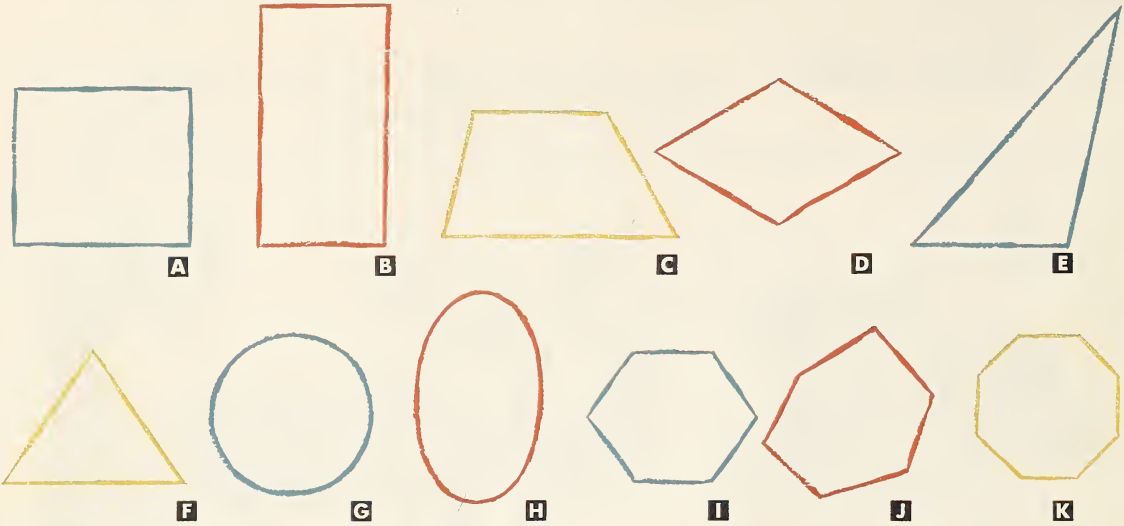
Moving forward

In this lesson you will learn more about different shapes and how to measure them.

180643


A
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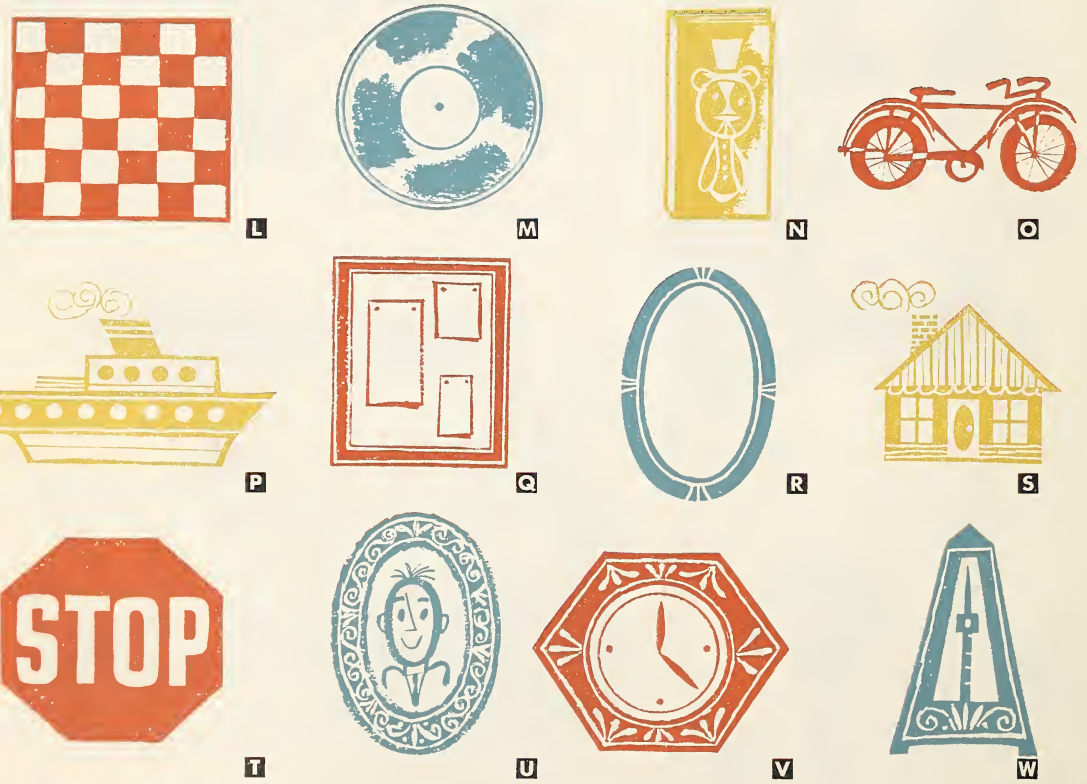
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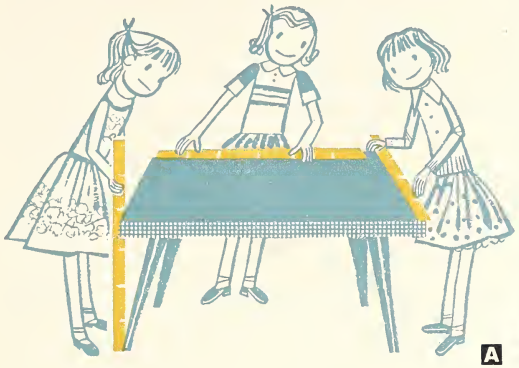
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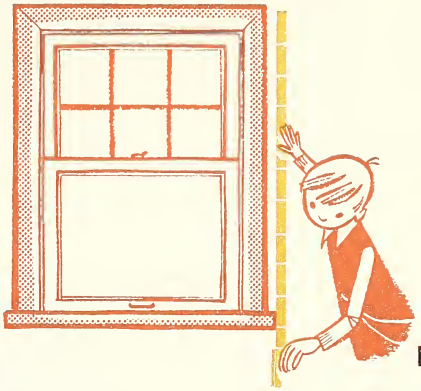
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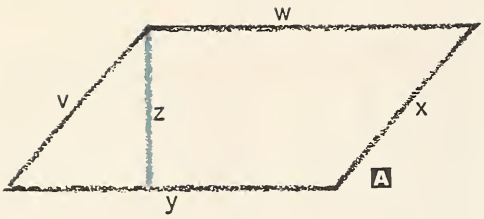
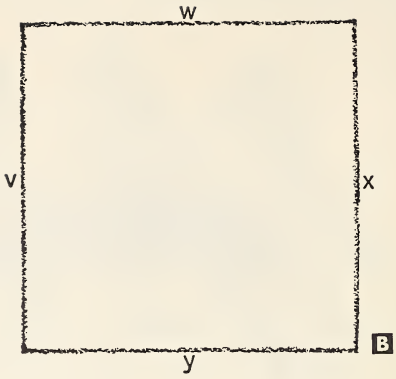

w
v
z
x
y
A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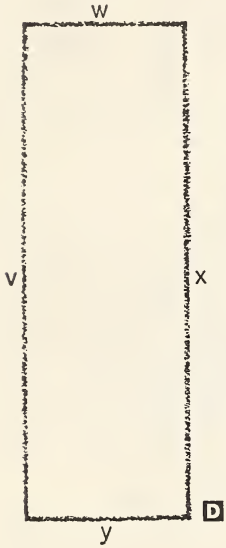
w
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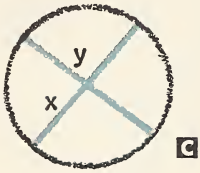
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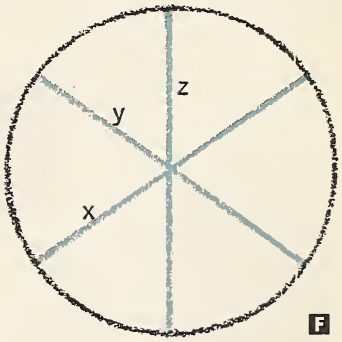
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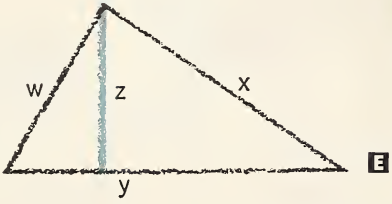
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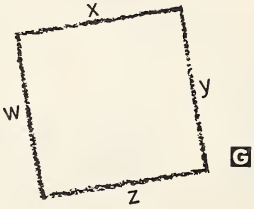
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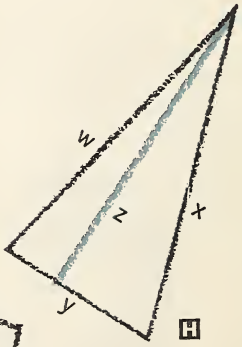
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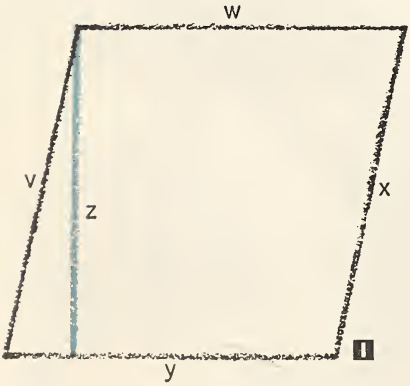
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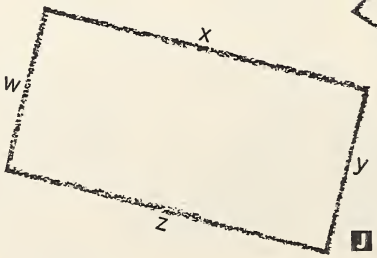
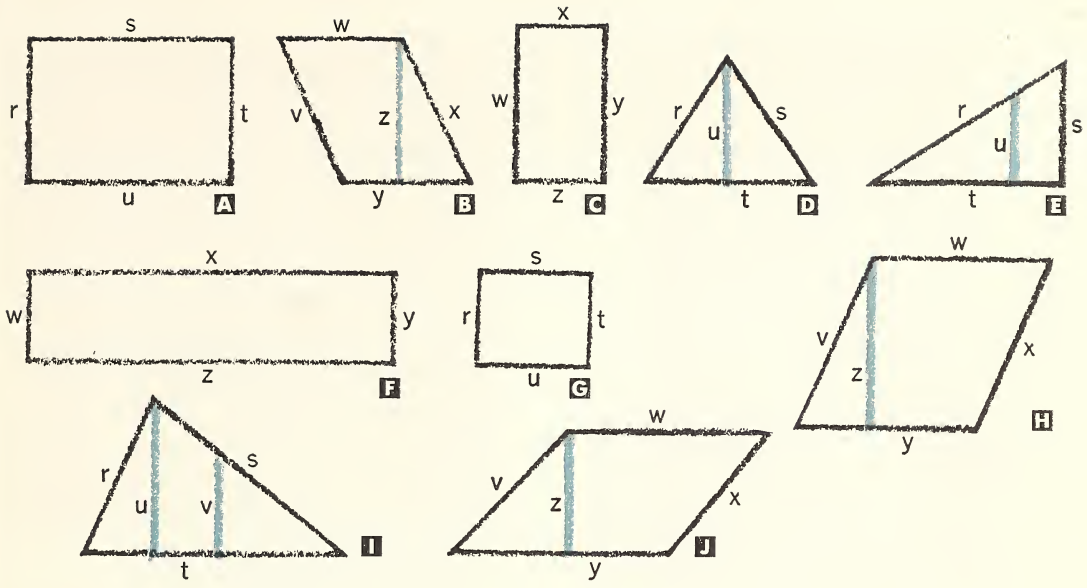
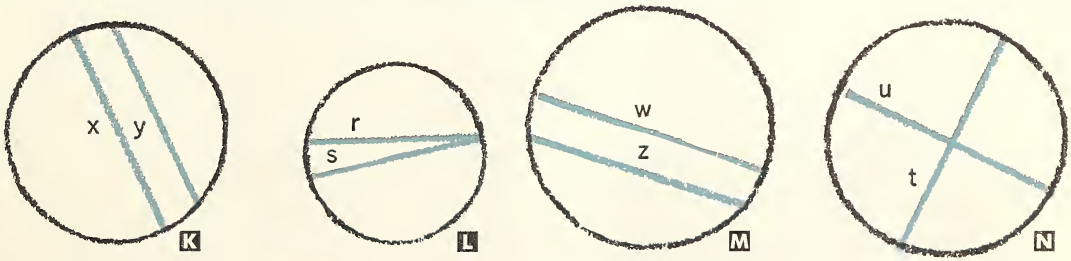

x
w
y
z
J



Picture	Base	Height or altitude
A	Line u	Line r
B	Line ▒	Line ▒
C	Line ▒	Line ▒
D	Line ▒	Line ▒
E	Line ▒	Line ▒

Picture	Base	Height or altitude
F	Line ▒	Line ▒
G	Line ▒	Line ▒
H	Line ▒	Line ▒
I	Line ▒	Line ▒
J	Line ▒	Line ▒

In each circle below, which line is the diameter?

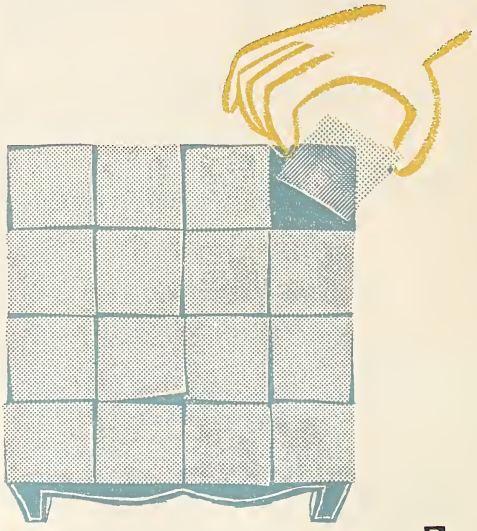


Now you should understand what is meant by length, width, height, base, altitude, and diameter.

Moving forward

In this lesson you will learn about a new kind of measurement, the measurement of area.

A



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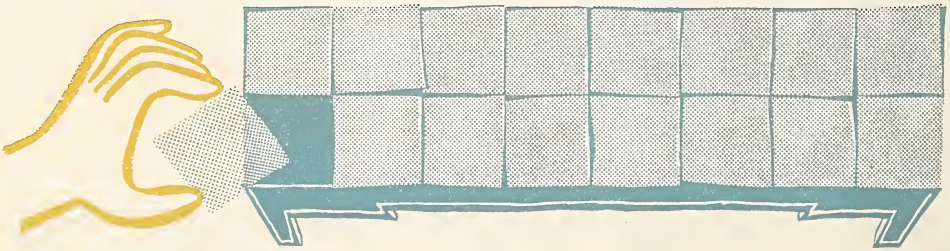

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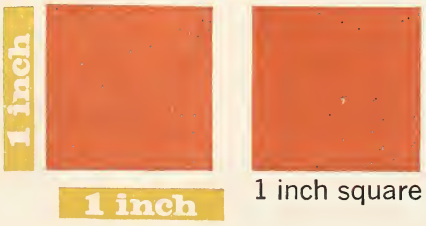
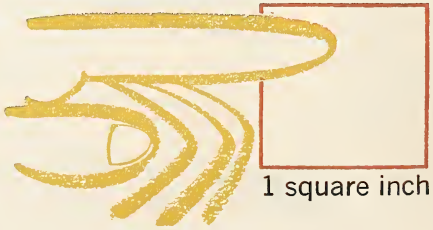
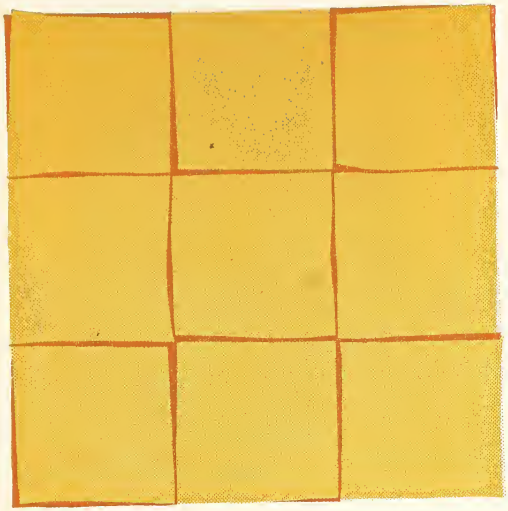


1 inch square

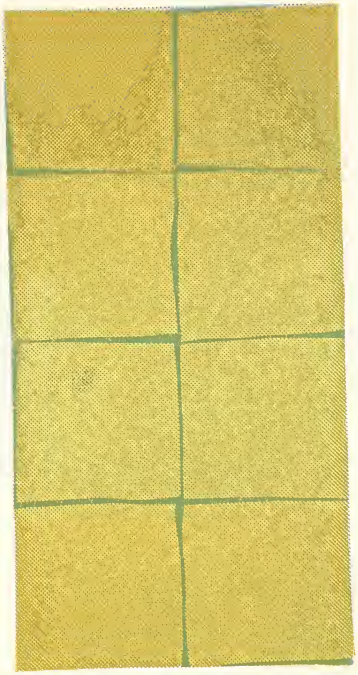


1 square inch

D



A



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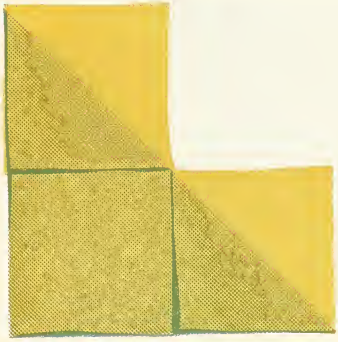

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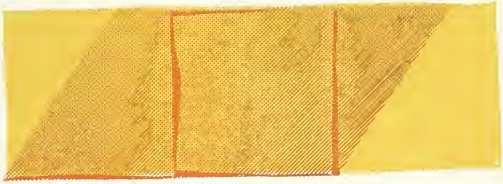

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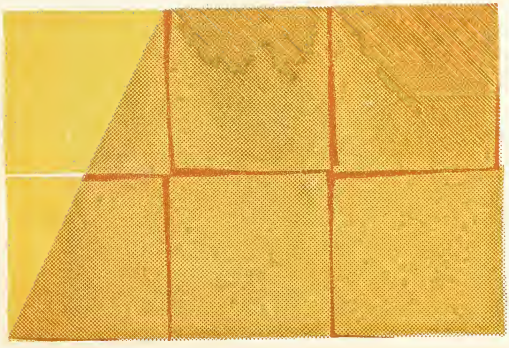

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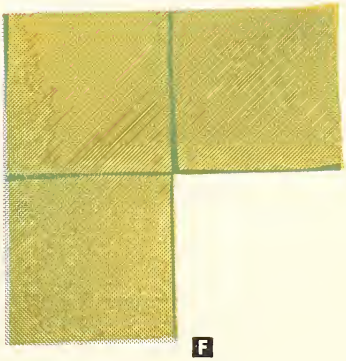

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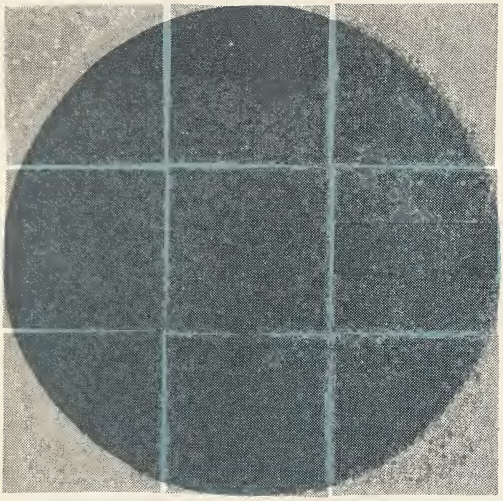

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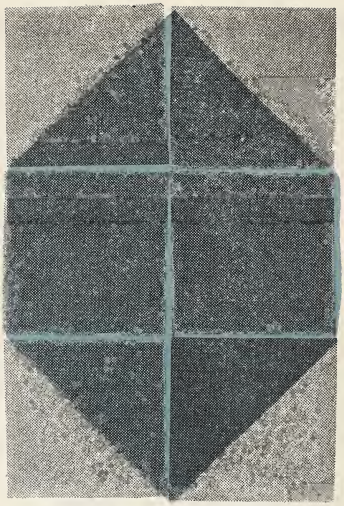
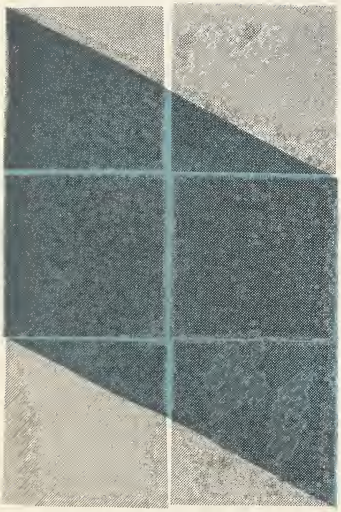


H



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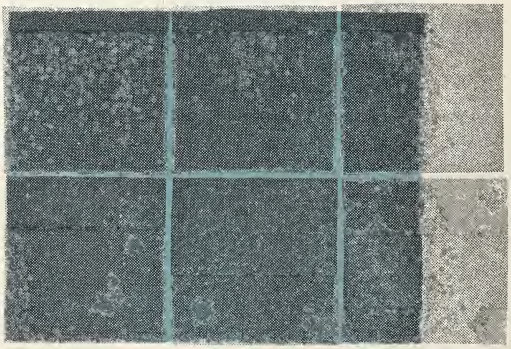

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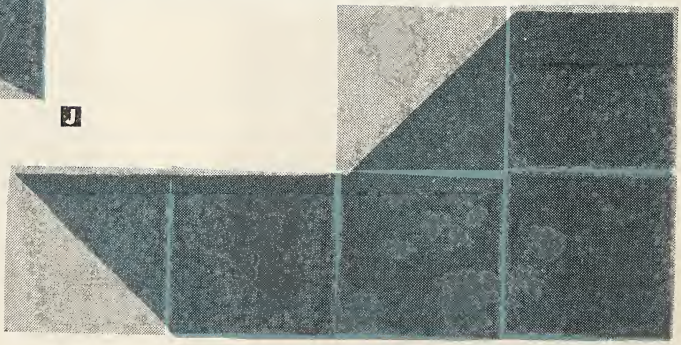
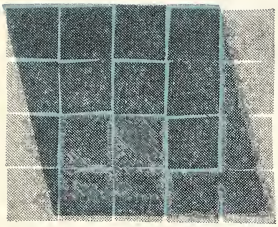


K

Imagine that the squares in each picture below are square inches. What area is shown in each? You can say that the area shown in Picture A is between 12 square inches and 20 square inches. It is about 16 square inches.



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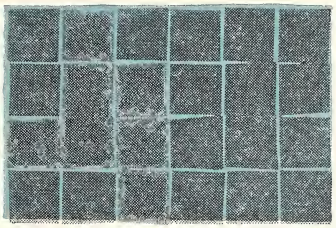

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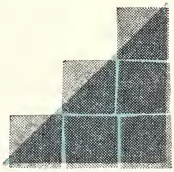

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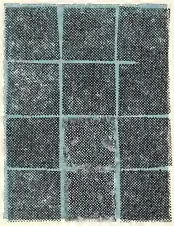

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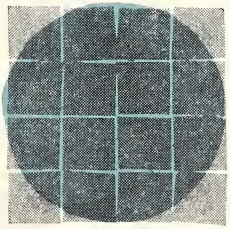
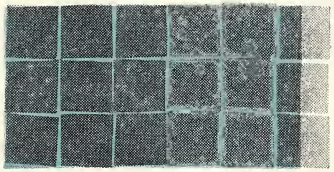


E

F



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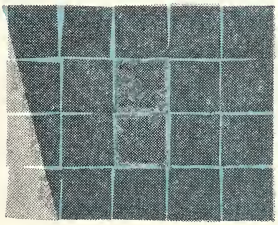

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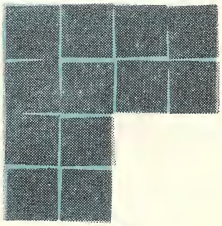
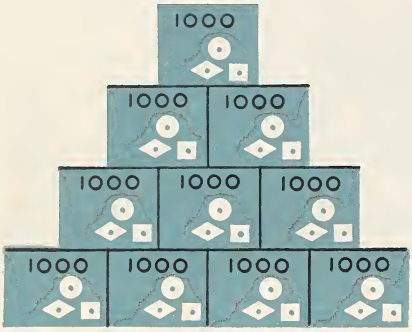


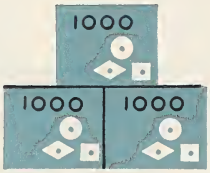
I

Now you should know what is meant by the area of a rectangle or circle or other flat shape.

Looking back

This lesson will help you check up on reading and writing numerals and on understanding numbers.





hundreds	tens	ones	hundreds	tens	ones
	1	3	4		

thousands

13,400

A thirteen thousand four hundred

hundreds	tens	ones	hundreds	tens	ones
	9				

thousands

90,000

ninety thousand

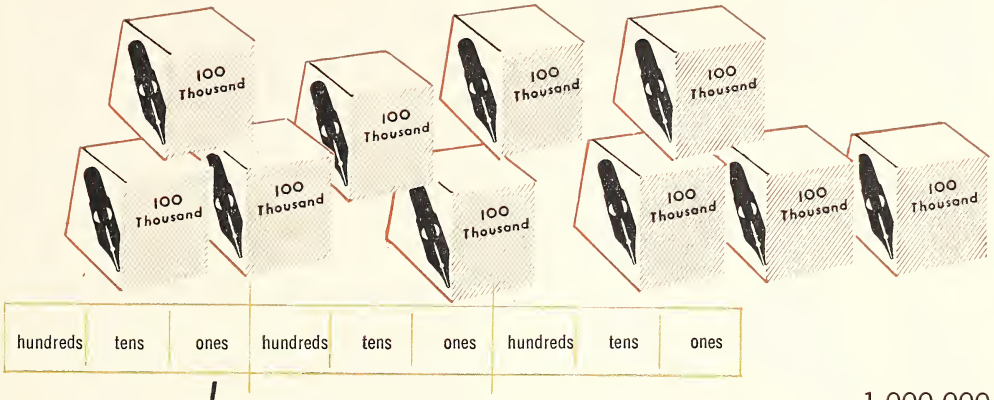
hundreds	tens	ones	hundreds	tens	ones
1					

thousands

100,000

one hundred thousand

B



1,000,000
one million **C**

Say million. Say thousand.

A 5,262,000
B 41,785,439
C 8,027,050
D 376,000,000
E 90,001,002
F 223,500,010

Read.

A 15,402,716
B 3,850,300
C 961,700,000
D 1,001,001
E 60,090,040
F 778,200,509

Write with numerals.

A three thousand nineteen
B six hundred twenty thousand four hundred one
C two million eighty thousand seven
D ninety-eight thousand ninety
E sixty-four million one hundred thousand four
F seven thousand five hundred six
G four hundred eight million seventy
H twenty-nine million eight hundred thousand
I seventy-one million thirty thousand
J one million nine hundred
K five hundred sixty-three thousand five

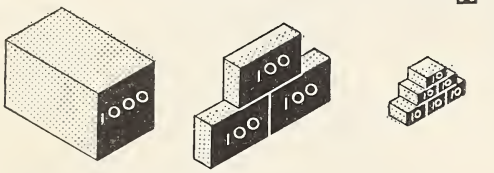
Read.

A 38,020
B 4,480,601
C 761,000
D 924,000,775
E 50,082,146
F 23,008
G 40,070,010
H 17,209
I 6,000,000
J 600,000
K 430,500,008
L 219,003
M 7460
N 8,004,002
O 113,030
P 72,900,404
Q 5,298,743
R 90,010,200

hundreds	tens	ones	hundreds	tens	ones
		1	2	16	

thousands

A



hundreds	tens	ones	hundreds	tens	ones
		1	3	6	

thousands

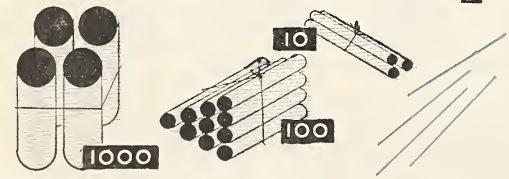
1360

hundreds	tens	ones	hundreds	tens	ones
		5		3	4

thousands

5034

B



hundreds	tens	ones	hundreds	tens	ones
		4	10	3	4

thousands

hundreds	tens	ones	hundreds	tens	ones
	7	15	9	1	2
	8	5	9	1	2

thousands

A

hundreds	tens	ones	hundreds	tens	ones
3	6	2	4	3	
3	5	12	4	3	

thousands

B

hundreds	tens	ones	hundreds	tens	ones
2	9	4	6		
2	8	?	6		

thousands

C

hundreds	tens	ones	hundreds	tens	ones
	1	5	18	4	3
	1	?	8	4	3

thousands

D

hundreds	tens	ones	hundreds	tens	ones
4	7	23	5		1
4	9	?	5		1

thousands

E

hundreds	tens	ones	hundreds	tens	ones
		8	2	1	5
		7	?	1	5

thousands

F

hundreds	tens	ones	hundreds	tens	ones
9		4	1	2	3
8	?	4	1	2	3

thousands

I

hundreds	tens	ones	hundreds	tens	ones
	2	9	5	13	4
	2	9	?	3	4

thousands

G

hundreds	tens	ones	hundreds	tens	ones
	3	6			2
	3	?	?	?	12

thousands

J

hundreds	tens	ones	hundreds	tens	ones
6	11	3		5	7
7	?	3		5	7

thousands

H

hundreds	tens	ones	hundreds	tens	ones
	3	8	31	9	7
	?	?	1	9	7

thousands

K

A In 16,472, the 1 is in what place?

B In 739,568, the 9 is in what place?

C In 208,411, the 2 is in what place?

D 7 thousands 21 hundreds 4 tens = ▒

E 4 ten thousands 16 thousands 7 hundreds 13 tens 9 ones = ▒

F 5126 = 4 thousands ▒ hundreds 1 ten ▒ ones

G 35,948 = 2 ten thousands ▒ thousands 9 hundreds 4 tens 8 ones

H 83,015 = 8 ten thousands ▒ thousands 10 hundreds 1 ten 5 ones

I 1 ten thousand 3 thousands 14 hundreds 2 tens 18 ones = ▒

J 6 ten thousands 25 thousands 4 hundreds 19 tens = ▒

K 9671 = ▒ thousands 16 hundreds ▒ tens 11 ones

L 46,309 = 4 ten thousands ▒ thousands 2 hundreds ▒ tens 9 ones

By now you should have a good understanding of the number system.

Side trip

	I 1	II 2	III 3				
IV 4	V 5	VI 6	VII 7	VIII 8			
IX 9	X 10	XI 11	XII 12	XIII 13	XIV 14	XV 15	XIX 19
		XX 20	XXVI 26	XXX 30	XXXV 35	XXXVII 37	
XL 40	L 50	XLIV 44	XLVIII 48	LIII 53	LX 60	LXX 70	LXXX 80
XC 90	C 100	XCIX 99	CXX 120	CC 200	CCC 300	CCCXCVIII 398	
CD 400	D 500	CDLX 460	DXLI 541	DC 600	DCC 700	DCCCII 802	
CM 900	M 1000	CMLXXIV 974	MD 1500	MDC 1600	MCMXIV 1914		

A Only seven letters are used to write all the Roman numerals. What are they?

B Look at the Roman numerals for 4, 9, 40, 90, 400, and 900. How are they made? In what way are they alike?

C Look at the Roman numerals for 2, 6, 11, 20, and 44. How are they made? In what way are they alike?

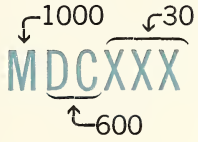
D Write the Roman numerals for the numbers from 20 to 30.

E Write the Roman numerals for the numbers 40 to 50.

F Write the Roman numerals for the numbers 90 to 100.

G Write the Roman numerals for the numbers 250 to 260.

H Write 1630 in Roman numerals this way.



Now write the Roman numerals for the numbers 1631 to 1640.

Read these Roman numerals.

A	XVII	**I**	XL	**Q**	LXXXIX
B	XXXII	**J**	XXIV	**R**	CMIX
C	LV	**K**	XIX	**S**	MCCXIV
D	LXI	**L**	XCIV	**T**	MDXIX
E	CIII	**M**	CDIX	**U**	MCMXL
F	CLVI	**N**	CDXL	**V**	MCDXLIV
G	CCCXX	**O**	CMXIX	**W**	MCMLVI
H	MVIII	**P**	CMXC	**X**	MDCCCXCIX

Write as Roman numerals.

A	8	**H**	85	**O**	344
B	16	**I**	101	**P**	519
C	37	**J**	125	**Q**	1215
D	53	**K**	149	**R**	1875
E	72	**L**	310	**S**	1969
F	78	**M**	318	**T**	1548
G	81	**N**	339	**U**	1776

A Our numerals are called Arabic numerals. Below is the number 2529, written with both Arabic and Roman numerals. We know that the 5 in 2529 shows hundreds because it is the third figure from the right. Which letter in MMDXXIX shows hundreds? Is it in the same position as the 5 in 2529?

B Can you tell how large a Roman numeral is by the number of letters it has? Why or why not?

C Which Arabic numeral means more, 3489 or 27,652? Does the number of figures help tell you which is larger?

D Write two Arabic numerals in which the number of figures does not tell you which numeral is larger.

E Write the Roman numerals for 7, 70, and 700. Does knowing the Roman numeral for 7 help you write the numeral for 70 or for 700? Why or why not?

F Write the Roman numerals for 39, 55, and 108 in a column and try to add them. What happens?

Checking up

Test 1

A $4+5+3+1=$ ▭
B $6+2+9=$ ▭
C $3+7+5+8=$ ▭
D $5+8+4+2=$ ▭
E $1+7+9+3=$ ▭
F $2+5+3+7+1=$ ▭
G $7+9+8+5+9=$ ▭
H $8+8+4+6+5=$ ▭

Test 2

A $84+27=$ ▭
B $50+15+33=$ ▭
C $29+44+58=$ ▭
D $17+32+9=$ ▭
E $61+75+80=$ ▭
F $46+20+74+38=$ ▭
G $98+17+53+72=$ ▭
H $85+66+92+57=$ ▭

Test 3

A $268+520=$ ▭
B $875+435=$ ▭
C $600+754=$ ▭
D $64+108+362=$ ▭
E $781+459+506=$ ▭
F $373+628+470=$ ▭
G $225+396+118=$ ▭
H $937+561+774=$ ▭

Test 4

A $72-38=$ ▭
B $87-51=$ ▭
C $60-42=$ ▭
D $94-24=$ ▭
E $45-37=$ ▭
F $82-63=$ ▭
G $90-19=$ ▭
H $86-30=$ ▭

Test 5

A $651-273=$ ▭
B $732-325=$ ▭
C $900-407=$ ▭
D $2435-816=$ ▭
E $5070-3284=$ ▭
F $8846-3420=$ ▭
G $3000-1492=$ ▭
H $4008-1769=$ ▭

Test 6

A $37¢+41¢+23¢=$ ▭
B $\$.97+\$.54+\$.72=$ ▭
C $\$2.16+\$4.29+\$1.95=$ ▭
D $85¢+\$1.68=$ ▭
E $\$3.07-\$1.49=$ ▭
F $\$7.00-\$4.21=$ ▭
G $\$6.41-\$2.85=$ ▭
H $\$12.00-\$9.17=$ ▭

Test 7

A $2\times9=$ ▭
B $3\times5=$ ▭
C $8\times3=$ ▭
D $5\times5=$ ▭
E $9\times4=$ ▭
F $3\times7=$ ▭
G $4\times2=$ ▭
H $3\times3=$ ▭
I $4\times8=$ ▭
J $6\times5=$ ▭
K $7\times2=$ ▭
L $5\times4=$ ▭
M $4\times7=$ ▭
N $6\times6=$ ▭
O $9\times3=$ ▭
P $4\times4=$ ▭
Q $3\times6=$ ▭
R $8\times2=$ ▭
S $5\times7=$ ▭
T $6\times4=$ ▭
U $4\times3=$ ▭
V $8\times4=$ ▭

Test 8

A $12\div2=$ ▭
B $27\div9=$ ▭
C $16\div8=$ ▭
D $25\div5=$ ▭
E $12\div3=$ ▭
F $20\div4=$ ▭
G $28\div7=$ ▭
H $24\div3=$ ▭
I $10\div2=$ ▭
J $18\div6=$ ▭
K $21\div7=$ ▭
L $36\div6=$ ▭
M $24\div4=$ ▭
N $36\div9=$ ▭
O $30\div5=$ ▭
P $16\div4=$ ▭
Q $35\div7=$ ▭
R $18\div9=$ ▭
S $14\div2=$ ▭
T $36\div4=$ ▭
U $32\div8=$ ▭
V $30\div6=$ ▭

Inventory tests on addition; subtraction; multiplication basic facts with products of 36 or less; division basic facts with dividends of 36 or less

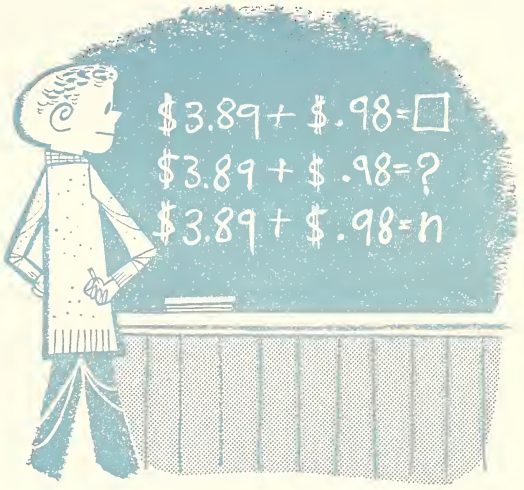
Exploring problems

A Each boy in the fifth grade needed $3.89 for gym shoes and $.98 for a gym shirt. How much money did each boy need for these two things?

Amount needed for gym shoes.
Amount needed for gym shirt.
Total amount needed.

$3.89 + $.98 = n

You must find this number.



B Each girl needed $3.89 for gym shoes, too. Jane paid for her shoes with a five-dollar bill. How much should the clerk have given her in change?

Amount Jane had at first.
Amount she spent.
Amount left.

$5.00 − $3.89 = n

You must find this number.

C Peggy brought 15 flowers to school on the first day. Sue brought 16 flowers to school. Together, the girls brought how many flowers?
15 + 16 = n

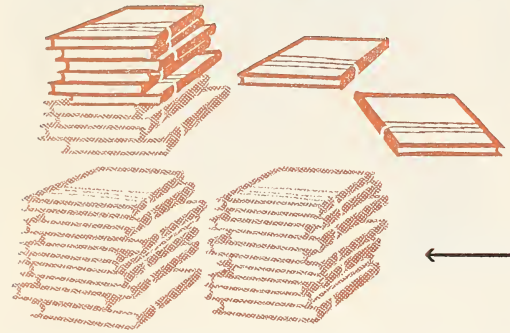
D There were 32 pupils in the fifth grade. Seventeen of them were girls. How many boys were in the fifth grade?
32 − 17 = n

E Ann went to the school store with 50¢. She spent 36¢ for a ruler and some crayons. How much money did she have left?

F Tom spent $1.78 for a lunch box and $.39 for a pencil box. How much did he spend for these two things?

G The clerk at the school store said that she sold 58 boxes of crayons on Tuesday and 67 boxes on Wednesday. She sold how many boxes of crayons on the two days?

A



A The fifth-grade class had 24 new arithmetic books. There were 32 pupils in the class. How many more arithmetic books were needed?

Number of books the class had.

Number of books that must be added.

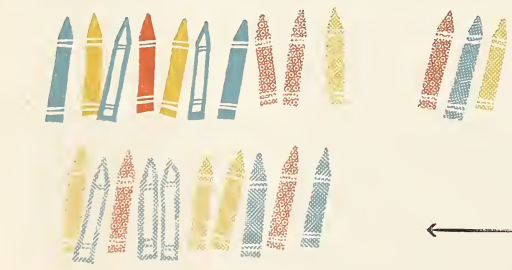
Total number of books needed.

$24+n=32$

You must find this number.

Imagine that 24 books are gone. Subtract 24 from 32.

B



B Nancy had some crayons. Then she bought a new box of 16 crayons. Now she has 23 crayons. How many crayons did she have at first?

Number of crayons Nancy had at first.

Number she bought.

Number she has now.

$n+16=23$

You must find this number.

Imagine that 16 crayons are gone. Subtract 16 from 23.

C The fifth-grade pupils brought sixteen pictures showing what they did during the summer. They also brought five scrapbooks telling what they did during the summer. How many more pictures did they bring than scrapbooks?

C

Match as many pictures as you can with scrapbooks. Then find the number of pictures that are not matched.

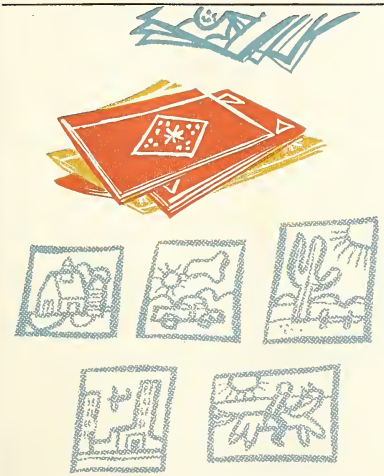
Number of pictures.

Number of pictures matched with scrapbooks. Imagine that these pictures are gone.

Number of pictures not matched with scrapbooks.

$16 - 5 = n$

You must find this number.



Imagine that 5 pictures are gone. Subtract 5 from 16.

D Fourteen fifth graders went on trips during the summer. Eighteen fifth graders stayed at home. How many fewer fifth graders went on trips than stayed at home?
$18 - 14 = n$

E Twelve boys and nine girls learned to swim during the summer. How many more boys than girls learned to swim? How many fewer girls than boys learned to swim?
$12 - 9 = n$

F Ellen and her family drove to a town 335 miles away. After the first day, they still had 87 miles to drive. How many miles had they driven on the first day?
$n + 87 = 335$

G The 21 Brownies in Sue's troop had sewing and cooking classes. Nine of the girls were in the sewing class. The others were in the cooking class. How many girls were in the cooking class?

H Don saved $7.50 during the summer to buy a record player. The record player he wanted to buy cost $14.35. How much more money did he need to buy the record player?

I When the children were weighed in the health class, Tony weighed 77 lb. Patsy weighed 68 lb. Tony weighed how much more than Patsy?

J When the children's heights were measured in the health class, John was 59 in. tall. Tom was 52 in. tall. Tom was how much shorter than John?

K This year the school library bought 528 new books. There are now 3395 books in the library. How many books did the library have before the new books were bought?

L 283 of the new books are story books. 97 of them are science books. How many of the new books are story books and science books?

M How many of the 528 new books are not science books or story books?

THINK In some problems you must use an answer from another problem. Where will you get a number you need to find the answer to Problem M?

N Peggy lives 14 blocks from school. Every morning her father drives her part of the way. Then she still has 6 blocks to walk. How many blocks does her father drive her?

Now you should be able to make equations for the addition and subtraction problems you have studied.

Thinking straight

A Dick read that 6,116,948 new passenger cars were sold in the United States in 1953. Is 6,116,948 approximate or exact? Why do you think so?

B Dick tried rounding off 6,116,948 in different ways to make the number easy to remember. First he rounded off the number to the nearest thousand. He wrote 6,117,000. Was he right? How do you know?

C Then Dick wrote 6,100,000. Was he rounding off 6,116,948 to the nearest hundred thousand or to the nearest ten thousand?

D Then Dick rounded off 6,116,948 to the nearest million. What should he have written? Why?

E What other ways can you think of to round off 6,116,948?

F Which of these ways of rounding off 6,116,948 do you think is most useful? Why?

Round off the numbers below.

		Nearest thousand	Nearest hundred thousand	Nearest million
G	1,738,669	1,739,000	1,700,000	
H	16,084,742			
I	36,025,888			
J	421,762,471			
K	704,551,099			

Keeping skillful

A	$7 \times 3 = n$	J	$12 \div 6 = n$	A	$37 + n = 71$	A	$60 - 22 = n$
B	$24 \div 8 = n$	K	$18 \div 2 = n$	B	$41 + 57 = n$	B	$401 - 176 = n$
C	$14 \div 2 = n$	L	$35 \div 5 = n$	C	$n + 208 = 600$	C	$732 - 489 = n$
D	$5 \times 2 = n$	M	$7 \times 4 = n$	D	$578 + n = 706$	D	$630 - 557 = n$
E	$15 \div 5 = n$	N	$24 \div 6 = n$	E	$n + 357 = 522$	E	$987 - 643 = n$
F	$5 \times 6 = n$	O	$4 \times 5 = n$	F	$836 + 409 = n$	F	$800 - 538 = n$
G	$3 \times 9 = n$	P	$3 \times 8 = n$	G	$66 + 18 + 59 = n$	G	$2073 - 1091 = n$
H	$20 \div 5 = n$	Q	$18 \div 3 = n$	H	$n + 278 = 1012$	H	$4000 - 2259 = n$
I	$32 \div 4 = n$	R	$28 \div 4 = n$	I	$318 + n = 837$	I	$1008 - 475 = n$

Exploring problems

A Kathy and Jane Fisher are going to polish teaspoons for their mother. There are 16 teaspoons. If the girls share the work equally, how many teaspoons should each girl polish?

Total number of spoons.

Number of spoons in each group.

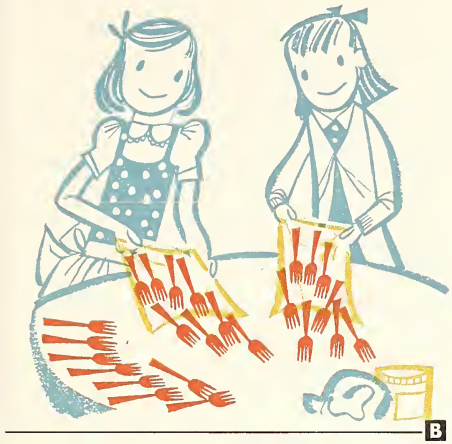
Number of equal groups of spoons.

$16 \div n = 2$

To find this number, you divide 16 by what number?

Each time the girls polish 1 spoon apiece, they polish a group of 2 spoons. How many groups of 2 spoons must they polish to finish the spoons?

Each girl has polished ▒ spoons in all.



B The girls have 3 cases of forks to polish, too. There are 8 forks in each case.
How many forks do the girls have to polish?

Number of groups, or cases, of forks.
Number of forks in each group.
Total number of forks.

$3 \times 8 = n$

You must find this number.

The girls have to polish ▒ forks.

C Mrs. Fisher has asked the girls to plant 12 flower bulbs in bowls. They are to put 3 bulbs in each bowl. How many bowls will the girls need?

Total number of bulbs.
Number of bulbs in each group.
Number of groups, or bowls, of 3 bulbs.

$12 \div 3 = n$

You must find this number.

The girls will need ▒ bowls.

D Tom Fisher was helping his father make a bookcase. The bookcase had 3 shelves, and each shelf was 7 ft. long. How many feet of boards in all did they need for the three shelves?

E Jane helped her mother with the ironing. She ironed 5 handkerchiefs in 15 minutes. If she spent the same amount of time on each handkerchief, how long did it take her to iron one handkerchief?

F Kathy ironed some dish towels. It took her about 5 minutes to iron each towel. About how many towels could she iron in 45 minutes?

G Tom was putting 30 packages of strawberries in the freezer for his mother. He could carry 6 packages each trip. How many trips did he have to make to the freezer?

H Jane helped her mother cut some ribbon. She needed pieces of ribbon 9 in. long. How many pieces of this length could Jane cut from 36 inches of ribbon?

I Tom took 8 empty bottles to the store. He got 3¢ apiece for them. How much money did he get for the 8 bottles?

J Mrs. Fisher went shopping with the girls. She bought 3 packages of rolls. There were 6 rolls in each package. How many rolls did she buy altogether?

K Jane bought 36¢ worth of candy bars at the grocery store. She bought 6 candy bars and paid the same price for each one. How much did each candy bar cost?

L Mrs. Fisher was buying ice cream. She needed enough ice cream for 10 people. She knew she could get 5 dishes from one quart. How many quarts of ice cream should she buy?

M Mrs. Fisher bought 4 cartons of orange drink. There were 6 bottles in each carton. How many bottles of orange drink did Mrs. Fisher buy?

N Mrs. Fisher also bought 3 small cans of baked beans at 9¢ a can. How much did she pay for the baked beans?

O Kathy bought 8 lollipops of the same kind at the store. She paid 32¢ for them. How much did each cost?

P Mrs. Fisher asked Kathy to buy 12 tomatoes. The tomatoes were sold in packages of 4. How many packages did Kathy need to buy?

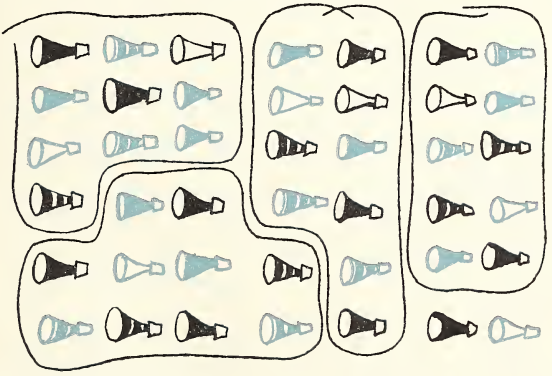
Now you should be able to make equations for the multiplication and division problems you have studied.

Looking back

This lesson will help you remember how to multiply to get the numbers from 40 to 81.

A There are 5 rows of 8 masks.
5 eights = ▒
5 × 8 = n

There are 8 rows of 5 masks.
8 fives = ▒
8 × 5 = n

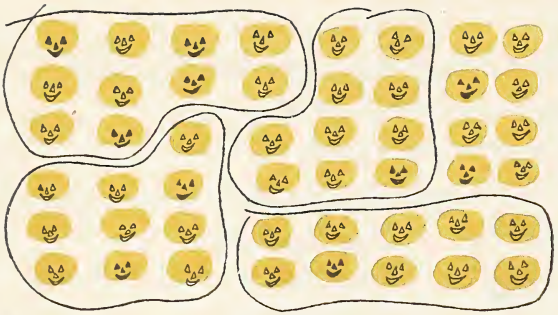


B There are ▒ rows of 7 horns.
6 sevens = ▒
6 × 7 = n

There are ▒ rows of 6 horns.
7 sixes = ▒
7 × 6 = n

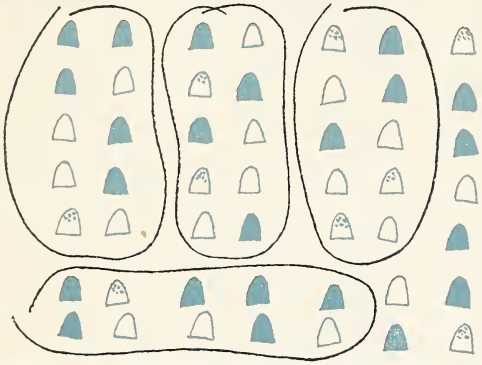
C There are ▒ rows of 9 cats.
5 nines = ▒
5 × 9 = n

There are ▒ rows of 5 cats.
9 fives = ▒
9 × 5 = n

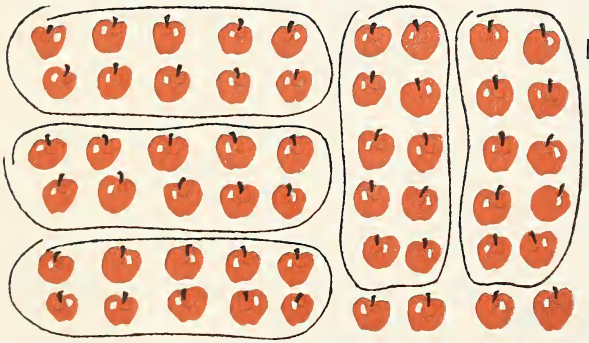


D There are ▒ rows of 8 pumpkins.
6 eights = ▒
$6 \times 8 = n$

There are ▒ rows of 6 pumpkins.
8 sixes = ▒
$8 \times 6 = n$



E There are ▒ rows of 7 candies.
7 sevens = ▒
$7 \times 7 = n$

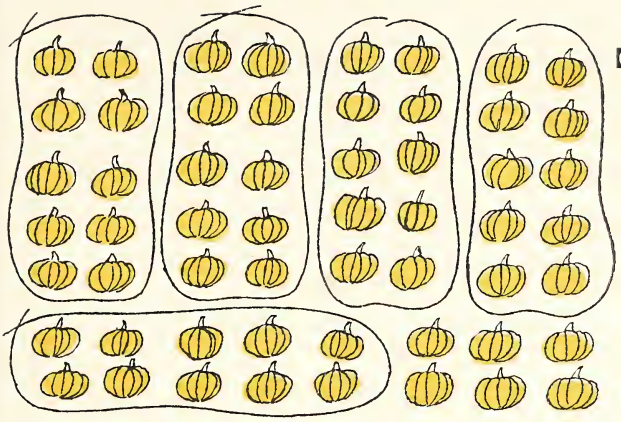


F There are ▒ rows of 9 apples.
6 nines = ▒
$6 \times 9 = n$

There are ▒ rows of 6 apples.
9 sixes = ▒
$9 \times 6 = n$

A $8 \times 6 = n$
B $5 \times 9 = n$
C $6 \times 7 = n$
D $8 \times 5 = n$
E $7 \times 7 = n$
F $6 \times 9 = n$
G $7 \times 6 = n$
H $6 \times 8 = n$
I $9 \times 5 = n$
J $5 \times 8 = n$
K $9 \times 6 = n$

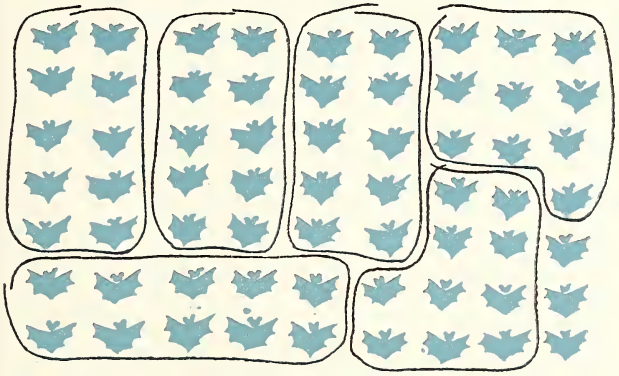
A $3 \times 4 = n$
B $5 \times 5 = n$
C $8 \times 3 = n$
D $3 \times 3 = n$
E $7 \times 3 = n$
F $6 \times 4 = n$
G $2 \times 6 = n$
H $7 \times 5 = n$
I $4 \times 5 = n$
J $3 \times 8 = n$
K $6 \times 3 = n$
L $4 \times 4 = n$



G

There are ▒ rows
of 8 pumpkins.
7 eights = ▒
7 × 8 = n

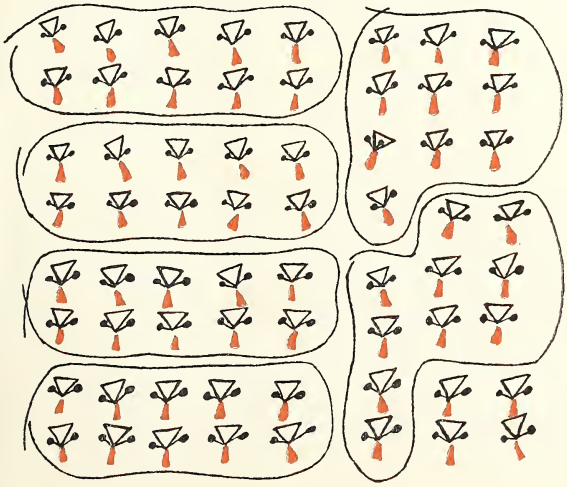
There are ▒ rows
of 7 pumpkins.
8 sevens = ▒
8 × 7 = n



H

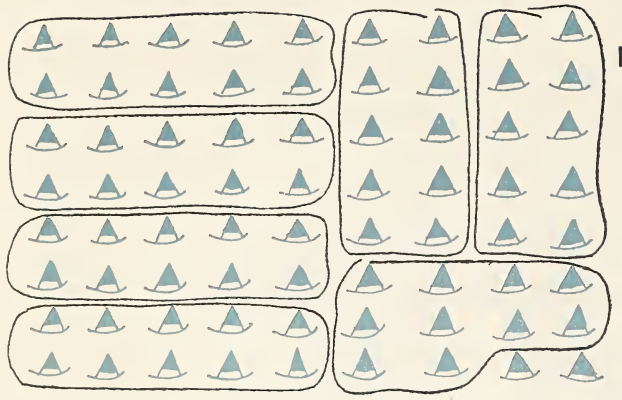
There are ▒ rows of 9 bats.
7 nines = ▒
7 × 9 = n

There are ▒ rows of 7 bats.
9 sevens = ▒
9 × 7 = n



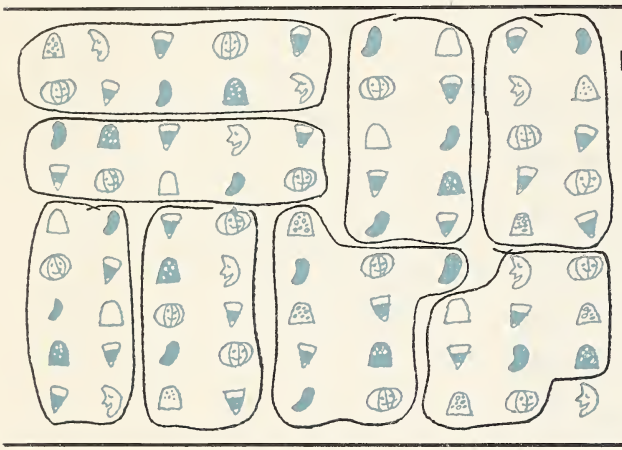
I

There are ▒ rows
of 8 noisemakers.
8 eights = ▒
8 × 8 = n



J There are ▭ rows of 9 hats.
8 nines = ▭
8 × 9 = n

There are ▭ rows of 8 hats.
9 eights = ▭
9 × 8 = n



K There are ▭ rows of 9 candies.
9 nines = ▭
9 × 9 = n

A 8 × 8 = n
B 8 × 9 = n
C 6 × 8 = n
D 8 × 5 = n
E 9 × 7 = n
F 7 × 7 = n
G 9 × 6 = n
H 5 × 9 = n
I 8 × 7 = n
J 5 × 8 = n

K 7 × 6 = n
L 6 × 9 = n
M 7 × 8 = n
N 6 × 7 = n
O 9 × 5 = n
P 7 × 9 = n
Q 9 × 8 = n
R 8 × 6 = n
S 9 × 9 = n

A 7 × 7 = n
B 2 × 7 = n
C 3 × 4 = n
D 6 × 2 = n
E 5 × 6 = n
F 4 × 6 = n
G 2 × 5 = n
H 7 × 3 = n
I 9 × 7 = n
J 3 × 9 = n

K 9 × 2 = n
L 9 × 9 = n
M 2 × 3 = n
N 9 × 8 = n
O 7 × 4 = n
P 6 × 9 = n
Q 8 × 7 = n
R 6 × 6 = n
S 8 × 8 = n
T 7 × 9 = n

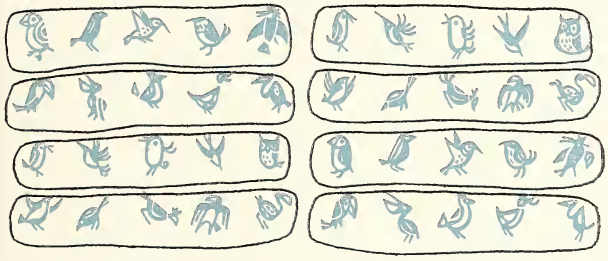
Now you should be able to multiply to get the numbers from 40 to 81.

Looking back

This lesson will help you remember how to divide the numbers from 40 to 81.

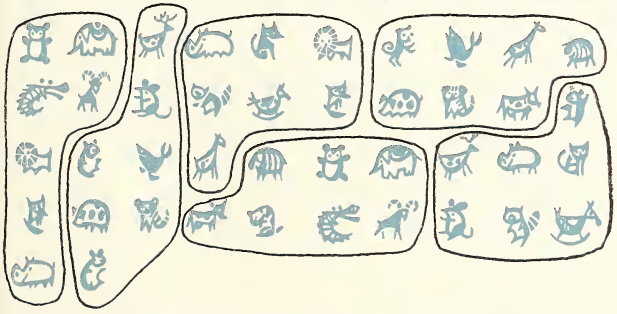
A

There are 40 birds in all.
The 40 birds are divided into groups of ▒.
There are ▒ groups of 8.
$40 \div 8 = n$



B

Now the 40 birds are divided into groups of ▒.
There are ▒ groups of 5.
$40 \div 5 = n$

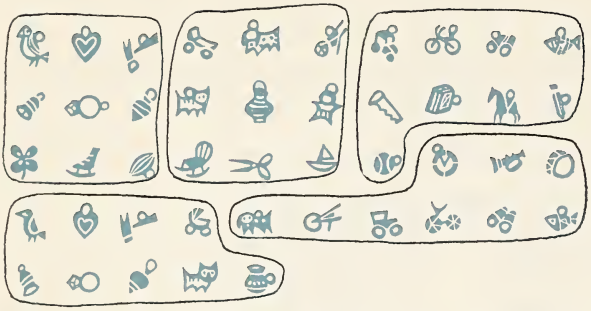


C

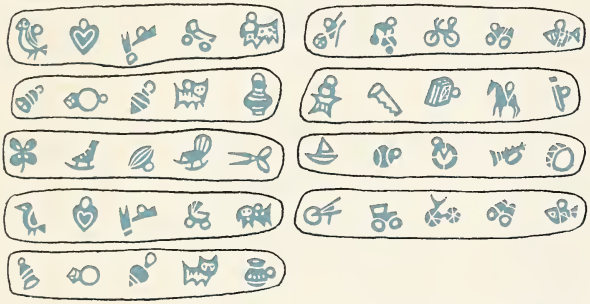
There are 42 animals in all.
The 42 animals are divided into groups of ▒.
There are ▒ groups of 7.
$42 \div 7 = n$

D

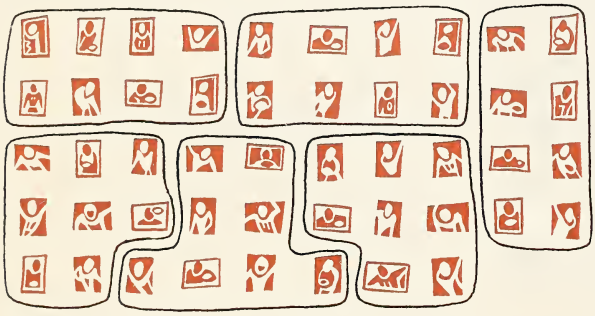
Now the 42 animals are divided into groups of ▒.
There are ▒ groups of 6.
$42 \div 6 = n$



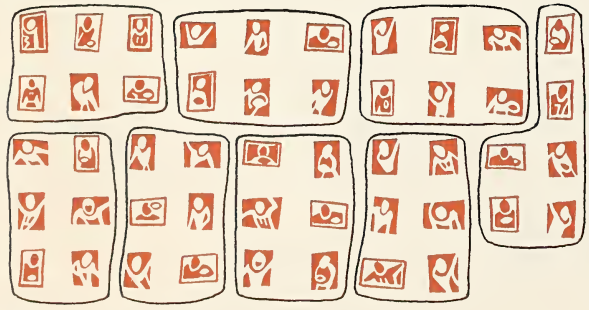
E There are 45 charms in all.
The 45 charms are divided into groups of ▒.
There are ▒ groups of 9.
45 ÷ 9 = n



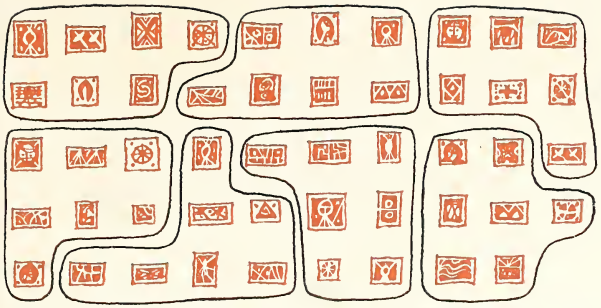
F Now the 45 charms are divided into groups of ▒.
There are ▒ groups of 5.
45 ÷ 5 = n



G There are 48 football cards in all.
The 48 football cards are divided into groups of ▒.
There are ▒ groups of 8.
48 ÷ 8 = n

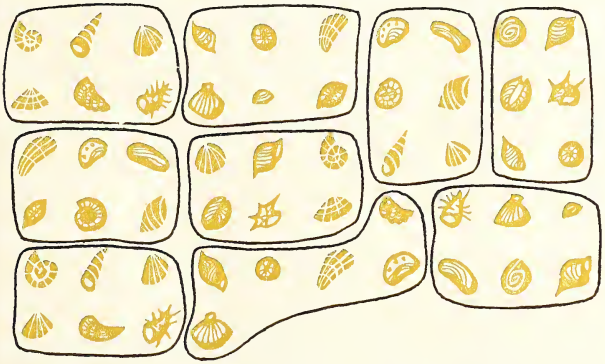


H Now the 48 football cards are divided into groups of ▒.
There are ▒ groups of 6.
48 ÷ 6 = n



I There are 49 stamps in all.
The 49 stamps are divided into groups of ▒.
There are ▒ groups of 7.
$49 \div 7 = n$

J There are 54 shells in all.
The 54 shells are divided into groups of ▒.
There are ▒ groups of 9.
$54 \div 9 = n$



K Now the 54 shells are divided into groups of ▒.
There are ▒ groups of 6.
$54 \div 6 = n$

A $42 \div 6 = n$
B $45 \div 5 = n$
C $48 \div 8 = n$
D $49 \div 7 = n$
E $40 \div 5 = n$
F $54 \div 6 = n$

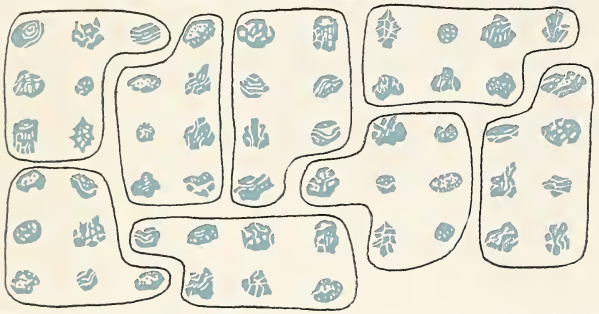
G $42 \div 7 = n$
H $48 \div 6 = n$
I $45 \div 9 = n$
J $40 \div 8 = n$
K $54 \div 9 = n$

A $27 \div 3 = n$
B $32 \div 8 = n$
C $36 \div 6 = n$
D $12 \div 4 = n$
E $15 \div 3 = n$
F $35 \div 7 = n$

G $16 \div 4 = n$
H $27 \div 9 = n$
I $21 \div 3 = n$
J $24 \div 6 = n$
K $25 \div 5 = n$
L $28 \div 4 = n$

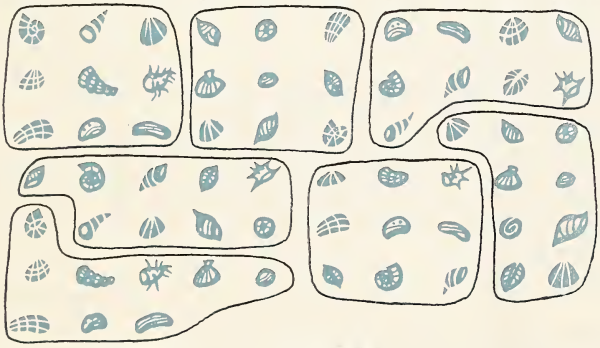
L

There are 56 stones in all.
The 56 stones are divided into groups of ▒.
There are ▒ groups of 8.
$56 \div 8 = n$



M

Now the 56 stones are divided into groups of ▒.
There are ▒ groups of 7.
$56 \div 7 = n$

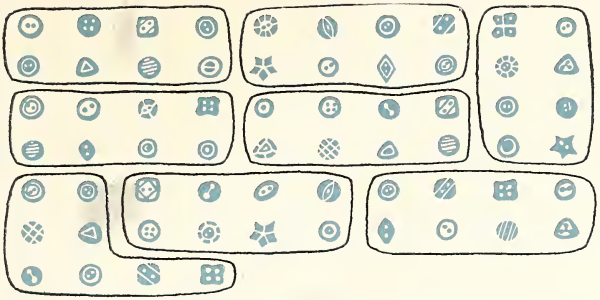


N

There are 63 shells in all.
The 63 shells are divided into groups of ▒.
There are ▒ groups of 9.
$63 \div 9 = n$

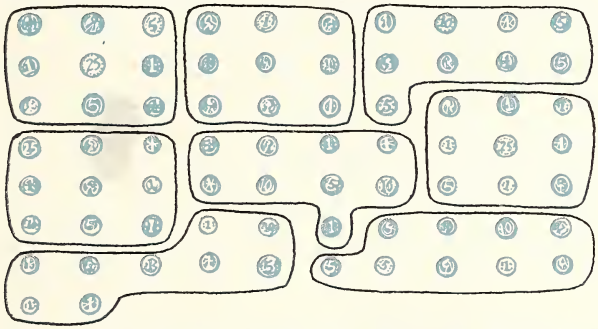
O

Now the 63 shells are divided into groups of ▒.
There are ▒ groups of 7.
$63 \div 7 = n$



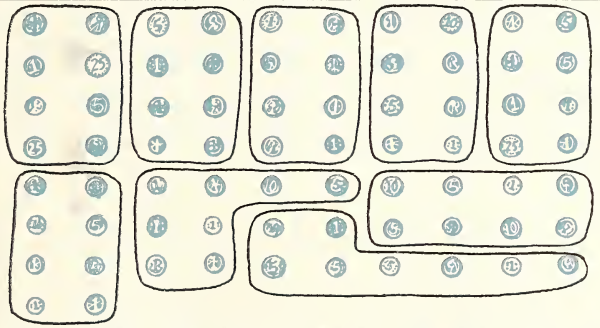
P

There are 64 buttons in all.
The 64 buttons are divided into groups of ▒.
There are ▒ groups of 8.
$64 \div 8 = n$



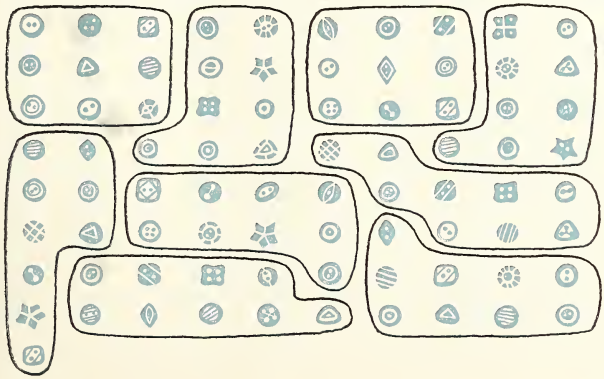
Q

There are 72 coins in all.
The 72 coins are divided into groups of ▒.
There are ▒ groups of 9.
$72 \div 9 = n$



R

Now the 72 coins are divided into groups of ▒.
There are ▒ groups of 8.
$72 \div 8 = n$



S

There are 81 buttons in all.
The 81 buttons are divided into groups of ▒.
There are ▒ groups of 9.
$81 \div 9 = n$

A $48 \div 6 = n$
B $42 \div 7 = n$
C $63 \div 9 = n$
D $54 \div 6 = n$
E $40 \div 5 = n$
F $64 \div 8 = n$
G $45 \div 5 = n$
H $49 \div 7 = n$
I $72 \div 8 = n$
J $42 \div 6 = n$

K $63 \div 7 = n$
L $81 \div 9 = n$
M $56 \div 7 = n$
N $48 \div 8 = n$
O $45 \div 9 = n$
P $40 \div 8 = n$
Q $54 \div 9 = n$
R $56 \div 8 = n$
S $72 \div 9 = n$

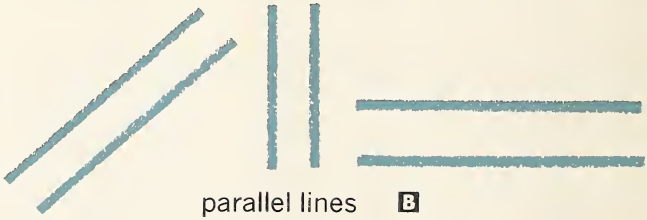
A $16 \div 2 = n$
B $21 \div 3 = n$
C $24 \div 6 = n$
D $14 \div 7 = n$
E $45 \div 9 = n$
F $36 \div 4 = n$
G $9 \div 3 = n$
H $35 \div 7 = n$
I $54 \div 6 = n$
J $30 \div 5 = n$

K $32 \div 8 = n$
L $12 \div 3 = n$
M $25 \div 5 = n$
N $81 \div 9 = n$
O $18 \div 3 = n$
P $28 \div 7 = n$
Q $64 \div 8 = n$
R $20 \div 4 = n$
S $27 \div 3 = n$
T $49 \div 7 = n$

Now you should know the important division equations for the numbers 40 to 81.

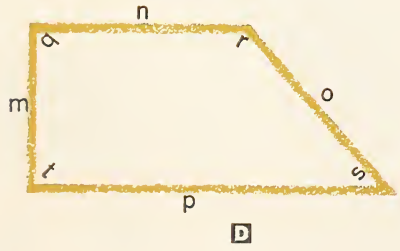
Thinking straight

square corner **A**
right angle



parallel lines **B**

C



D

Use Pictures A and B to help you answer these questions.

A In Picture C, the sides marked u and ▒ are parallel.

B In Picture C, the sides marked t and v are ~~~.

C In Picture C, the corners marked w, ▒, ▒, and ▒ are right angles.

D In Picture D, which sides are parallel?

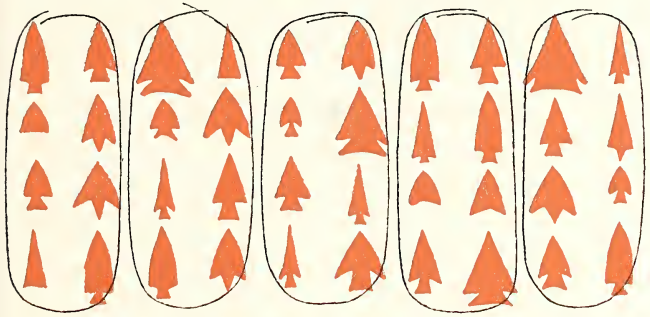
E In Picture D, which sides are not parallel?

F In Picture D, which corners are right angles?

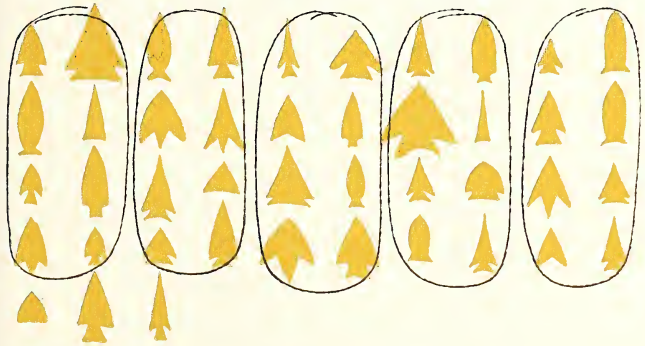
G Which corners are not right angles?

Looking back

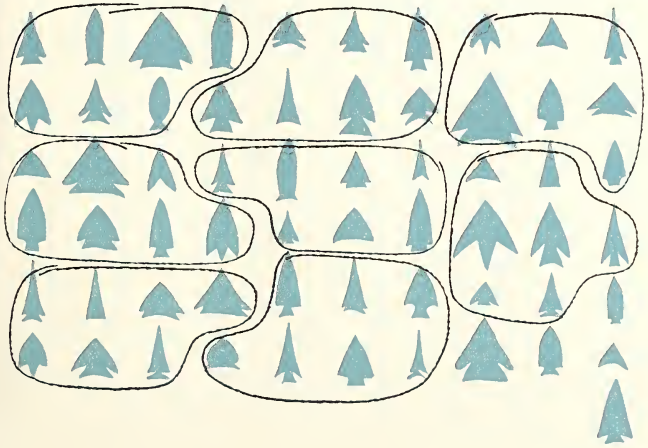
This lesson will help you remember about the remainder in division.



A Put the 40 arrowheads in groups of 8.
There are ▒ groups of 8.
$40 \div 8 = n$



B Put the 43 arrowheads in groups of 8.
There are ▒ groups of 8.
Are any arrowheads left over?
$43 \div 8 = n$
The answer is ▒ and ▒ remainder.



C Put the 61 arrowheads in groups of 7.
There are ▒ groups of 7.
Are any arrowheads left over?
$61 \div 7 = n$
The answer is ▒ and ▒ remainder.

A Which numbers can be divided by 5 without a remainder?
35 36 37 38 39 40 41 42 43

B Which numbers can be divided by 8 without a remainder?
64 65 66 67 68 69 70 71 72

C Which numbers can be divided by 4 without a remainder?
26 19 32 11 16 28 39 20 36

D Which numbers can be divided by 7 without a remainder?
21 44 35 50 26 49 63 37 56

E Which numbers can be divided by 3 without a remainder?
14 22 27 18 10 9 15 13 20

F Which numbers can be divided by 8 without a remainder?
58 48 42 32 56 19 24 66 40

G Which numbers can be divided by 2 without a remainder?
16 3 15 18 7 12 19 10 14

H Which numbers can be divided by 6 without a remainder?
42 26 38 48 20 30 54 16 24

I Which numbers can be divided by 9 without a remainder?
29 45 63 73 81 36 84 27 54

A Is there a remainder when you divide 55 by 6?

B Is there a remainder when you divide 34 by 4?

C Is there a remainder when you divide 18 by 2?

D Is there a remainder when you divide 53 by 7?

E Is there a remainder when you divide 30 by 5?

F Is there a remainder when you divide 70 by 9?

G Is there a remainder when you divide 29 by 3?

H Is there a remainder when you divide 72 by 8?

A	$56 \div 9 = n$	**A** $24 \div 5 = n$
B	$17 \div 2 = n$	**B** $31 \div 4 = n$
C	$50 \div 6 = n$	**C** $66 \div 7 = n$
D	$36 \div 8 = n$	**D** $75 \div 9 = n$
E	$33 \div 5 = n$	**E** $14 \div 3 = n$
F	$55 \div 7 = n$	**F** $32 \div 6 = n$
G	$22 \div 3 = n$	**G** $19 \div 2 = n$
H	$38 \div 4 = n$	**H** $65 \div 8 = n$
I	$53 \div 8 = n$	**I** $40 \div 5 = n$
J	$29 \div 5 = n$	**J** $81 \div 9 = n$
K	$84 \div 9 = n$	**K** $58 \div 7 = n$
L	$30 \div 7 = n$	**L** $27 \div 3 = n$
M	$47 \div 8 = n$	**M** $19 \div 6 = n$
N	$46 \div 6 = n$	**N** $26 \div 4 = n$

Now you should understand that often there is a remainder when you divide.

Checking up

	Test 1	Test 2	Test 3	Test 4
A	$8 \times 8 = n$	$42 \div 7 = n$	$38 \div 5 = n$	$82 \div 9 = n$
B	$7 \times 9 = n$	$48 \div 6 = n$	$25 \div 3 = n$	$63 \div 7 = n$
C	$7 \times 7 = n$	$40 \div 8 = n$	$18 \div 4 = n$	$48 \div 9 = n$
D	$8 \times 5 = n$	$45 \div 9 = n$	$29 \div 5 = n$	$60 \div 9 = n$
E	$6 \times 7 = n$	$49 \div 7 = n$	$13 \div 2 = n$	$52 \div 6 = n$
F	$8 \times 6 = n$	$54 \div 9 = n$	$40 \div 8 = n$	$47 \div 7 = n$
G	$5 \times 9 = n$	$63 \div 7 = n$	$29 \div 3 = n$	$44 \div 8 = n$
H	$9 \times 9 = n$	$42 \div 6 = n$	$27 \div 6 = n$	$41 \div 5 = n$
I	$8 \times 7 = n$	$40 \div 5 = n$	$39 \div 6 = n$	$57 \div 7 = n$
J	$6 \times 8 = n$	$64 \div 8 = n$	$23 \div 4 = n$	$70 \div 9 = n$
K	$9 \times 8 = n$	$54 \div 6 = n$	$37 \div 8 = n$	$59 \div 8 = n$
L	$7 \times 6 = n$	$45 \div 5 = n$	$28 \div 4 = n$	$50 \div 7 = n$
M	$5 \times 8 = n$	$48 \div 8 = n$	$21 \div 3 = n$	$44 \div 6 = n$
N	$9 \times 5 = n$	$72 \div 9 = n$	$32 \div 5 = n$	$72 \div 9 = n$
O	$8 \times 9 = n$	$56 \div 8 = n$	$10 \div 3 = n$	$45 \div 5 = n$
P	$6 \times 9 = n$	$81 \div 9 = n$	$20 \div 8 = n$	$71 \div 8 = n$
Q	$7 \times 8 = n$	$72 \div 8 = n$	$16 \div 5 = n$	$57 \div 6 = n$
R	$9 \times 7 = n$	$63 \div 9 = n$	$38 \div 4 = n$	$41 \div 7 = n$
S	$9 \times 6 = n$	$56 \div 7 = n$	$30 \div 9 = n$	$77 \div 9 = n$

Keeping skillful

A	$532 + 307 = n$	$n + 49 = 72$	$856 - 421 = n$
B	$49 + 37 + 74 = n$	$83 + 91 = n$	$605 - 228 = n$
C	$60 + 26 + 41 = n$	$28 + n = 80$	$300 - 174 = n$
D	$189 + 436 + 275 = n$	$346 + 277 = n$	$9730 - 5126 = n$
E	$330 + 794 + 503 = n$	$584 + n = 809$	$7054 - 3898 = n$
F	$58 + 162 + 329 = n$	$n + 608 = 737$	$5226 - 4719 = n$
G	$897 + 645 + 771 = n$	$173 + n = 400$	$2003 - 765 = n$
H	$254 + 920 + 538 = n$	$3896 + n = 6000$	$4805 - 2763 = n$
I	$341 + 650 + 209 = n$	$7994 + 2681 = n$	$6001 - 5372 = n$

End-of-block tests on multiplication and division basic facts with products and dividends from 40 to 81; division with remainders

see

John had some white mice. He sold 6 of them. Then he had 4 mice left. How many mice did he have before he sold the 6 mice?

A

You do not know how many mice John had at first.

n ← Number of mice John had at first

B

He sold 6 mice.

$n-6$ ← Number of mice he sold

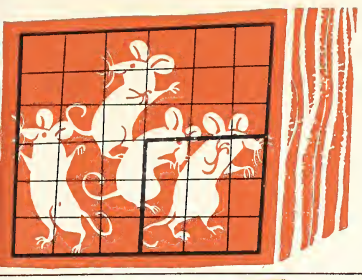
C

He had 4 mice left.

$n-6=4$ ← Number of mice left

You must find this number.

Reteaching of finding how many items there were at first when the number gone and the number left are known

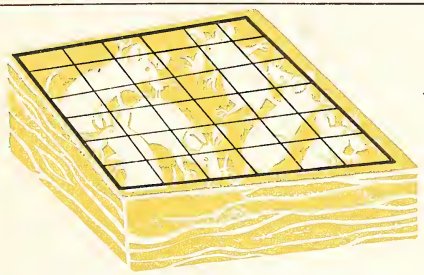


compute

D

You know that John had 4 mice left.

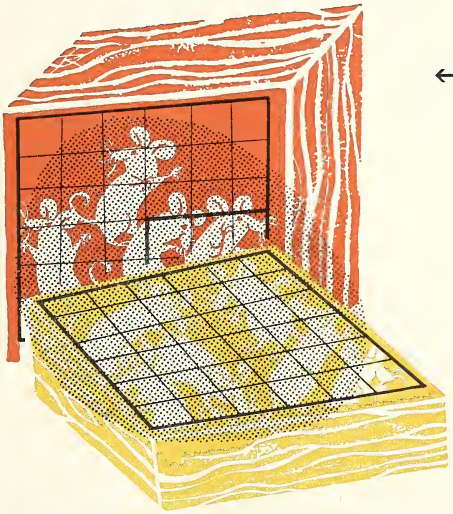
4 ← Number of mice left



E

You also know that he sold 6 mice.

6 ← Number of mice John sold



F

Imagine that the group of 6 mice is put back with the group of 4 mice.

$$\begin{array}{r} 4 \\ 6 \\ \hline \end{array}$$ ← Add 6 to 4.

$$\begin{array}{r} 4 \\ 6 \\ \hline 10 \end{array}$$ ← He had 10 mice.

The sum of 4 and 6 tells how many mice John had to begin with.

$n - 6 = 4$ ← This number is 10. John had 10 mice to begin with.

A Dick made a playground for his parakeet. After he had spent $.87 for boards and sticks, he had $2.36 left in his bank. How much money was in his bank before he bought materials for the playground?

Total amount in Dick's bank.
Amount spent for materials.
$n - \$.87 = \$2.36$
Amount left.
You must find this number.

Add $.87 to $2.36.
There was ▒ in Dick's bank before he bought the materials.

B Peggy bought some goldfish. Five of them died. Now she has 13 goldfish left. Peggy had how many goldfish before the five fish died?
$n - 5 = 13$ Add 5 to 13.

C Ann says that food for rabbits should be carefully weighed. One day she gave her rabbits 18 oz. of carrots. Then she had 15 oz. of carrots left. How many ounces of carrots did she have to begin with?
$n - 18 = 15$ Add 18 to 15.

D Ann feeds her rabbits only fresh vegetables. Each day the rabbits need an amount of vegetables equal in weight to their own weight. One rabbit weighs 31 oz. The other weighs 29 oz. How many ounces of fresh vegetables in all should Ann give her rabbits each day?

E After Carol paid 35¢ for two mice, she had $1.58. How much money did she have before she bought the mice?

F Nancy bought a bell and some seed for her parakeet. The bell cost $.16. The seed cost $.37. How much did Nancy spend for these two things?

G Nancy is trying to save $5 to buy a new cage for her parakeet. So far she has saved $2.78. How much more money does she need to save?

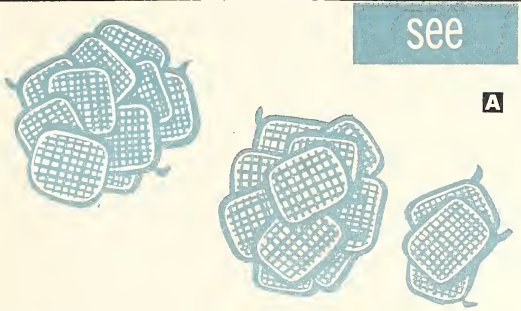
H Dick says that his parakeet can say 7 words. Nancy says that her parakeet can say 19 words. Nancy's parakeet can say how many more words than Dick's parakeet?

I One Saturday David bought some cans of food for his cats. The cats ate 9 cans during the week. Then there were 15 cans left. How many cans of cat food had David bought?

In many of these problems you knew how many things were taken away and how many were left. Then you found how many things there were to begin with.

Exploring problems

see



A

Patsy made 23 potholders. She sold some of them one Saturday. Then she had 11 potholders left. How many potholders had she sold?

Patsy made 23 potholders.

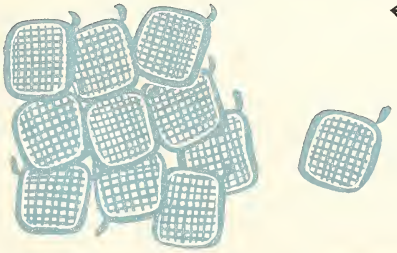
23 ← Number of potholders made

B

← You do not know how many potholders she sold.

$23 - n$ ← Number of potholders sold

← There were 11 potholders left.



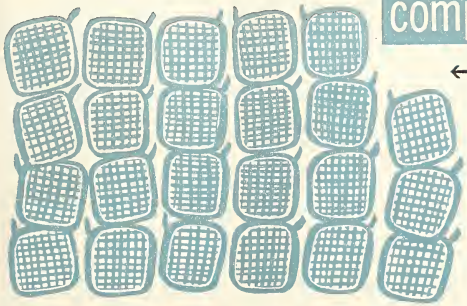
C

$23 - n = 11$

Number of potholders left

You must find this number.

compute

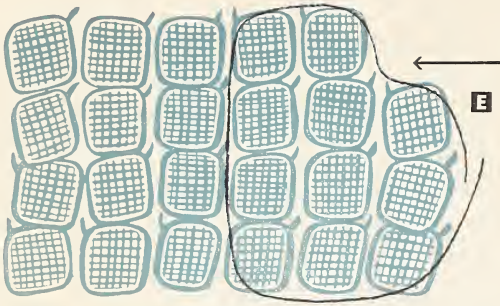


D

← You know that Patsy had 23 potholders to begin with.

23 ← Number of potholders to begin with

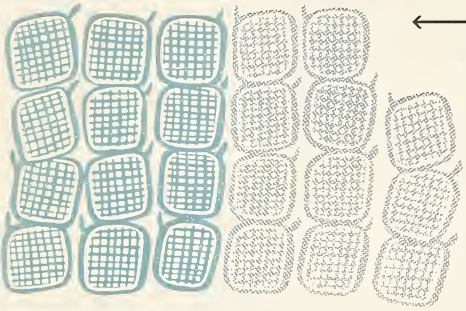
Now turn the page.



E

Think of a group of potholders equal in number to the potholders left.

11 ← Number of potholders left



F

Imagine that this group of 11 potholders is gone.

$$\begin{array}{r} 23 \\ 11 \\ \hline \end{array}$$

Subtract 11 from 23.

$$\begin{array}{r} 23 \\ 11 \\ \hline 12 \end{array}$$

The number left tells how many potholders Patsy sold. She sold 12.

$23 - n = 11$ ← This number is 12. Patsy had sold 12 potholders.

A Jane made 30 bookmarks. She gave some away. Then she had 16 of them left. How many did she give away?

Number of bookmarks she made.

Number she gave away.

Number of bookmarks left.

$30 - n = 16$ ← You must find this number.

Subtract 16 from 30.

Jane gave away ▒ bookmarks.

B George printed 50 calling cards for his father on his new printing press. He spoiled some and had to throw them away. He had 41 cards left. How many cards had he spoiled?

$50 - n = 41$ Subtract 41 from 50.

C George also printed 63 tickets for a pet show. After he and his friends had sold some tickets, they had 38 left. How many tickets had they sold?

$63 - n = 38$ Subtract 38 from 63.

D Carol and her sister made 64 pieces of fudge one day. The next day only 18 pieces were left. How many pieces of fudge were gone?

E Patsy had $2. She bought materials to make potholders. Then she had $.37. How much money had she spent for materials?

F David sold some of his 81 foreign stamps to Tom. Then David had 55 foreign stamps. How many foreign stamps did he sell to Tom?

G Betty made 36 pieces of fudge and 49 pieces of peanut candy. She made how many fewer pieces of fudge than pieces of peanut candy?

H Jim had 37 baby fish. He sold 19 of them. How many baby fish did he have then?

I Jim went to the pet store with $1.50. He bought fish food and plants and came home with $.68. How much money had he spent at the pet store?

J A bird that Jim wants to buy costs $6.50. He has saved $3.69 for it. How much more money does he need?

K Ann made 17 dolls with pipe cleaners. She took some dolls to school and kept 6 dolls at home. How many dolls did she take to school?

L When Ann started to make dolls, she had 96 pipe cleaners. After she had finished making the dolls, there were 8 pipe cleaners left. How many pipe cleaners had Ann used?

M Twenty-four of the 96 pipe cleaners were white. The rest were red. How many pipe cleaners were red?

In many of these problems you were finding how many things were given away or used up or sold.

Keeping skillful

A $84 - n = 37$
B $90 - n = 51$
C $n - 176 = 80$
D $403 - n = 159$
E $n - 628 = 342$
F $3710 - n = 2465$
G $2005 - n = 728$

A $48 + n = 106$
B $n + 29 = 52$
C $56 + 139 = n$
D $n + 704 = 936$
E $581 + n = 2090$
F $4615 + 9308 = n$
G $8673 + 2426 = n$

A $400 - 228 = n$
B $876 - 345 = n$
C $504 - n = 97$
D $821 - 556 = n$
E $7837 - n = 4289$
F $5080 - 2665 = n$
G $6001 - 5207 = n$

Using arithmetic

A At the Lake School, 151 children were in a pageant. 87 were dressed as Indians, and the others were dressed as Pilgrims. How many children were dressed as Pilgrims?

B There were how many more Indians than Pilgrims in the pageant?

THINK What numbers from Problem A do you need?

C There were how many fewer Pilgrims than Indians?

D The fifth graders collected money to buy materials for the pageant. They spent $3.55 of this money. Then they still had $7.25 left to spend. How much money had they collected?

E Betty and Jim went to the store to buy more materials. They spent $.65 for white paper, $.72 for black paper, and $4.99 for paint. How much money did they spend?

F Jim gave the clerk $7.00 to pay for the paper and paint. How much change should the clerk have given him?

G On the way back to school, Jim said, "I know I had 89¢ when we left the store, but now I have only 45¢. I must have lost some money." How much money had Jim lost?

H 42 children made wigwams for the pageant. 6 children worked on each wigwam. How many wigwams did the 42 children make?

I Bob made 9 Indian headdresses. He used 8 red feathers in each one. How many red feathers did he use in making the 9 headdresses?

J He used 6 blue feathers in each headdress. How many blue feathers did he use altogether?

K He put an equal number of yellow feathers in each headdress. For the 9 that he made, he used 27 yellow feathers. How many yellow feathers did he put in each headdress?

L How many feathers altogether did Bob use in making the headdresses?

M He used how many fewer yellow feathers than red feathers?

N He used how many more red feathers than blue feathers?

O He used how many more blue feathers than yellow feathers?

P Each of 8 girls made an equal number of paper collars. Altogether, the 8 girls made 56 collars. How many collars did each girl make?

Q Mary sold tickets for the pageant in the morning. In the afternoon she sold 18 more tickets. Then she said, "I sold 53 tickets today." How many tickets had she sold in the morning?

R She sold how many fewer tickets in the afternoon than in the morning?

S Jack sold 27 tickets in the morning. In the afternoon he sold more tickets. Then he said, "I sold 60 tickets today." How many tickets had he sold in the afternoon?

T The pageant began with a group of Indians dancing. After 24 more Indians had joined the first group and had begun dancing, there were 56 Indians dancing. How many of them were dancing when the pageant began?

U Don counted some Pilgrims as they marched by. First, 24 Pilgrim boys marched by. Next came some Pilgrim girls. After Don had counted them, he said, "That makes 40 Pilgrims in all." How many of the Pilgrims were girls?

V How many more boys than girls did Don count?

W How many fewer girls than boys did Don count?

Looking back

A 6 tens = 60
12 tens = 120
B 6 hundreds = 600
12 hundreds = 1200
C 23 tens = 23 ~
D 54 tens = ▒
E 38 tens = ▒
F 20 tens = ▒
G 41 hundreds = 41 ~
H 33 hundreds = ▒
I 27 hundreds = ▒
J 64 hundreds = ▒
K 19 hundreds = ▒
L 72 hundreds = ▒
M 90 hundreds = ▒

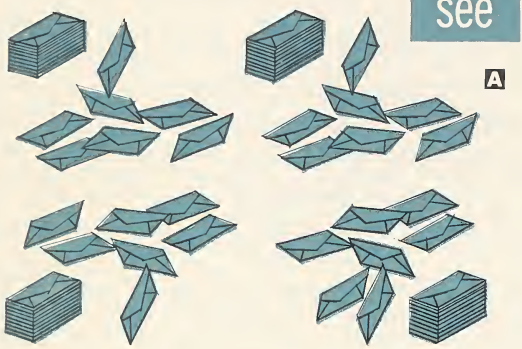
A 5 × 8 tens = 40 tens
40 tens = 40 ~
B 4 × 2 hundreds =
8 hundreds
8 hundreds = 8 ~
C 3 × 6 tens = ▒
D 7 × 7 tens = ▒
E 2 × 6 tens = ▒
F 8 × 4 tens = ▒
G 9 × 3 tens = ▒
H 6 × 5 tens = ▒
I 5 × 4 hundreds = ▒
J 2 × 7 hundreds = ▒
K 8 × 3 hundreds = ▒
L 7 × 9 hundreds = ▒

A 3 × 70 is 3 × 7 tens.
3 × 7 tens = ▒
B 2 × 600 is
2 × 6 hundreds.
2 × 6 hundreds = ▒
C 7 × 50 = n
D 9 × 60 = n
E 8 × 200 = n
F 7 × 400 = n
G 5 × 40 = n
H 6 × 300 = n
I 9 × 500 = n
J 8 × 80 = n
K 8 × 700 = n
L 3 × 900 = n

Learning how

In this lesson you will learn how to multiply numbers that have two figures in them.

see

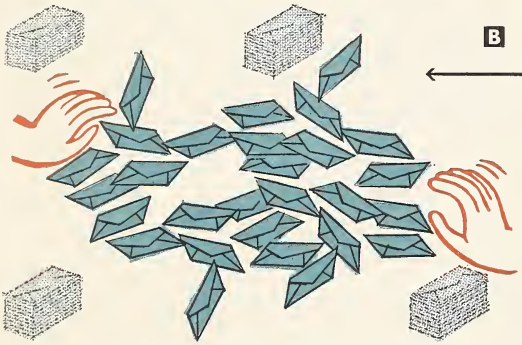


A

Four girls were addressing invitations to a party at school. Sue said, "If each one of us takes 17 envelopes, we will finish the work in a few minutes." How many envelopes did the girls have to address?

$4 \times 17 = n$

You must find this number.

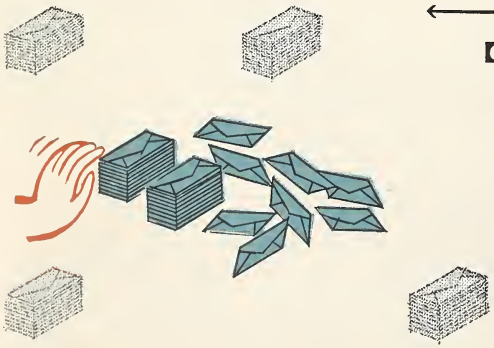


B

Put the 4 groups of 7 envelopes together.

$$\begin{array}{r} 17 \\ \times\ 4 \\ \hline \end{array}$$

Multiply 7 ones by 4. There are 28 ones.



C

Make 2 new piles of 10 envelopes. You have 8 envelopes left over.

$$\begin{array}{r} 17 \\ \times\ 4 \\ \hline 8 \end{array}$$

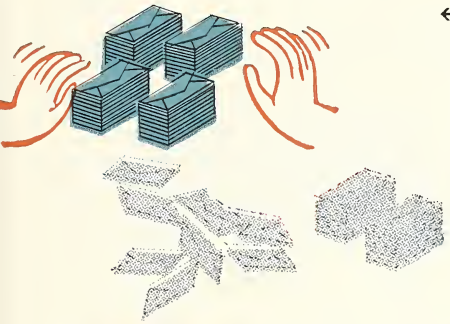
28 is 2 tens 8 ones. Write 8 here to show that there are 8 ones in the answer.

D

Put the 2 new piles of 10 envelopes aside.

$$\begin{array}{r} 17 \\ \times\ 4 \\ \hline 8 \end{array}$$

Remember that you have 2 more tens.

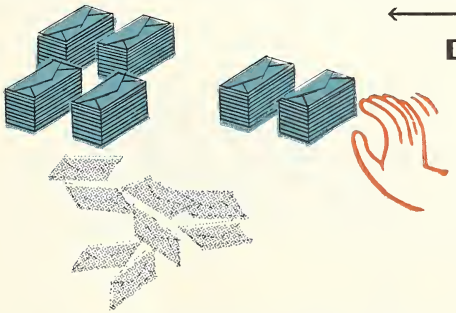


E

Now put the 4 old piles of 10 envelopes together.

$$\begin{array}{r} 17 \\ \times\ 4 \\ \hline 8 \end{array}$$

Multiply 10, or 1 ten, by 4. There are 4 tens.



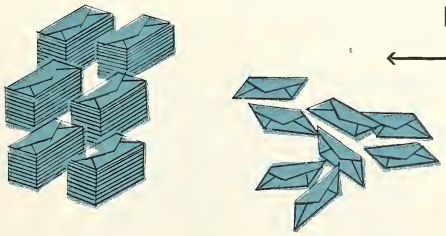
F

Put the 2 new piles of ten with the 4 piles of ten.

$$\begin{array}{r} 17 \\ \times\ 4 \\ \hline 68 \end{array}$$

You had 2 tens to remember. Now add them to the 4 tens. There are 6 tens in all.

Write 6 here to show there are 6 tens in the answer.



G

The girls had 68 envelopes to address.

$4 \times 17 = 68$

think

A

Three girls promised to bring doughnuts to the school party. Each girl promised to bring 36 doughnuts. How many doughnuts in all did the girls promise to bring?

$3 \times 36 = n$

You must find this number.

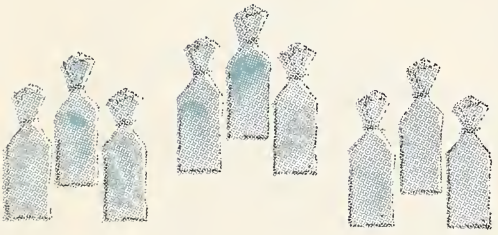
What do you put together first?

B

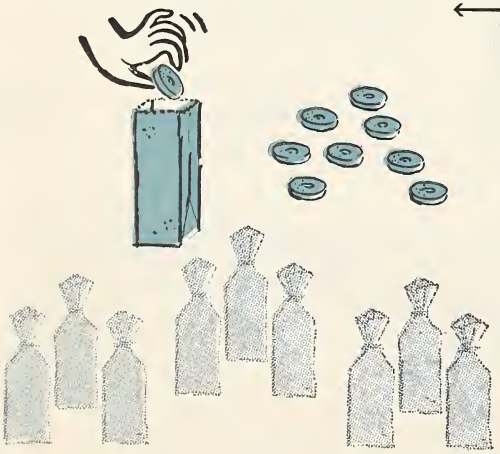
What do you multiply first?

$\begin{array}{r} 36 \\ \times\ 3 \\ \hline \end{array}$

How many ones are there?



How many new bags of 10 doughnuts can you make? Will any doughnuts be left over?

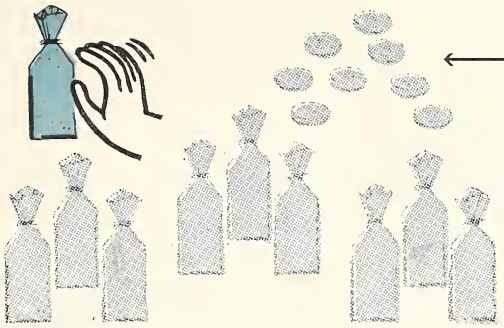


C

$\begin{array}{r} 36 \\ \times\ 3 \\ \hline 8 \end{array}$

18 is 1 ten ▒ ones.

Why do you write 8 here?



D

What do you do with the new bag of 10 doughnuts?

$$\begin{array}{r} 36 \\ \times\ 3 \\ \hline 8 \end{array}$$

What must you remember?

E

Now what do you put together?

$$\begin{array}{r} 36 \\ \times\ 3 \\ \hline 8 \end{array}$$

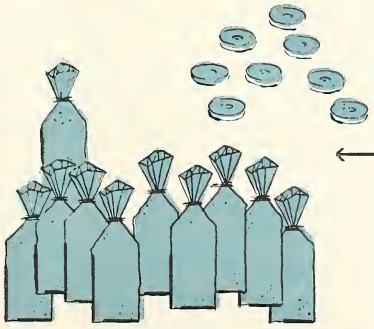
Now what do you multiply? How many tens are there?

F

What do you do with the new bag of 10?

$$\begin{array}{r} 36 \\ \times\ 3 \\ \hline 108 \end{array}$$

Why do you write 10 here instead of 9?



G

The girls promised to bring ▒ doughnuts to the party.

$3 \times 36 = n$

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try

A Mrs. Fisher bought 5 lb. of salted peanuts for the party. The salted peanuts cost $.49 a pound. How much did the 5 pounds cost?

$5 \times \$.49 = n$

$$\begin{array}{r} \$\ .49 \\ \times\ \ 5 \\ \hline \$2.45 \end{array}$$

Multiply just as you do with any numbers.

← Remember to put a point and dollar sign in the answer.

B $85 \times 8 = n$

$$\begin{array}{r} 85 \\ \times\ \ 8 \\ \hline 680 \end{array}$$

Always multiply by the smaller number. ←

C $9 \times 48 = n$

$$\begin{array}{r} 48 \\ \times\ \ 9 \\ \hline 432 \end{array}$$

D $3 \times 33 = n$

$$\begin{array}{r} 33 \\ \times\ \ 3 \\ \hline 99 \end{array}$$

do

A Mrs. Black bought 12 packages of paper cups. There were 6 cups in a package. She bought how many cups in all?

$12 \times 6 = n$

B Mrs. Page bought 6 gallons of apple cider at $.95 a gallon. How much did the 6 gallons of cider cost?

$6 \times \$.95 = n$

C A gallon of cider should fill 16 cups. How many cups should 6 gallons of cider fill?

$6 \times 16 = n$

D Mrs. Black also bought 4 packages of paper plates. There were 24 plates in a package. She bought how many plates in all?

$4 \times 24 = n$

E $7 \times 35 = n$
F $3 \times 41 = n$
G $62 \times 5 = n$
H $8 \times \$.14 = n$
I $26 \times 3 = n$
J $2 \times 94 = n$
K $4 \times \$.23 = n$
L $7 \times 15 = n$

M $55 \times 6 = n$
N $2 \times \$.53 = n$
O $9 \times 77 = n$
P $4 \times 32 = n$
Q $19 \times 8 = n$
R $5 \times 64 = n$
S $9 \times \$.39 = n$
T $13 \times 5 = n$

A $8 \times 57 = n$
B $6 \times 92 = n$
C $3 \times \$.80 = n$
D $44 \times 9 = n$
E $18 \times 7 = n$
F $2 \times 87 = n$
G $75 \times 8 = n$
H $6 \times \$.28 = n$

I $45 \times 4 = n$
J $9 \times 66 = n$
K $5 \times 74 = n$
L $4 \times 58 = n$
M $76 \times 2 = n$
N $89 \times 6 = n$
O $5 \times \$.40 = n$
P $7 \times \$.95 = n$

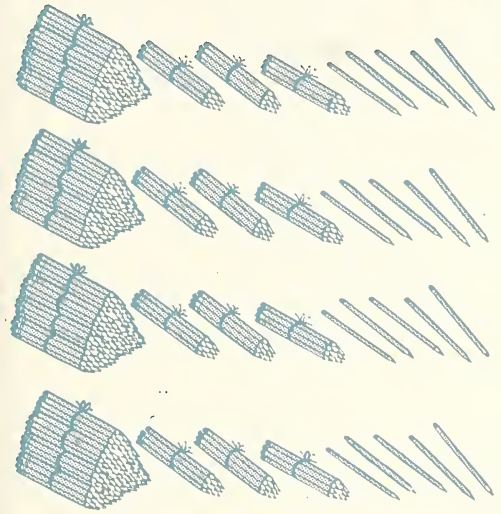
Now you should be able to multiply any two-figure number by any one-figure number.

Learning how

In this lesson you will learn how to multiply numbers with three figures in them.

see

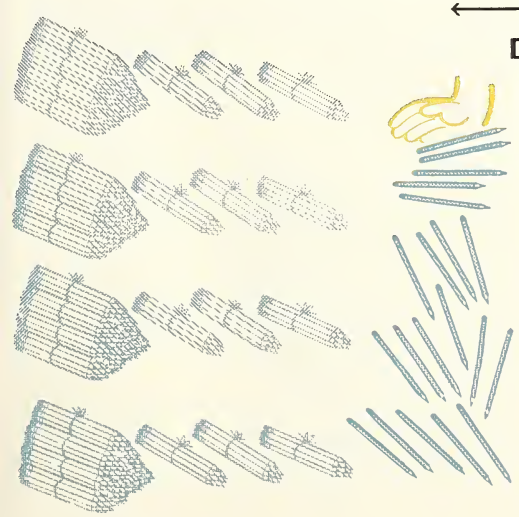
A



The boys and girls at the Burns School use about 135 pencils each week. About how many pencils do they use in 4 weeks?

$4 \times 135 = n$ — You must find this number.

B

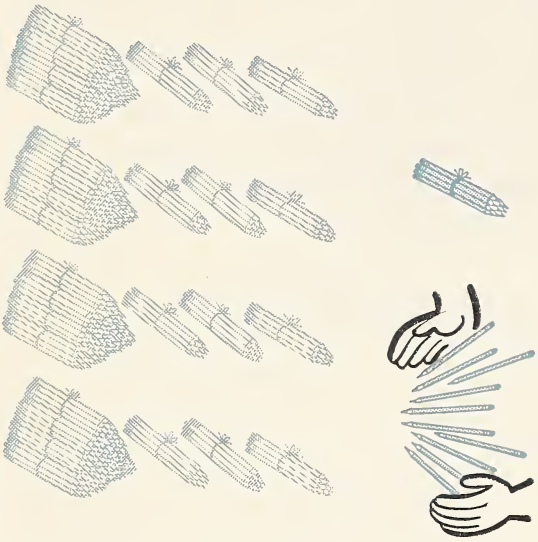


First put the 4 groups of 5 pencils together.

$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline \end{array}$$

Multiply 5 ones by 4. There are 20 ones.

Now turn the page.



← Make 2 new bundles of 10 pencils.
There are no single pencils left over.

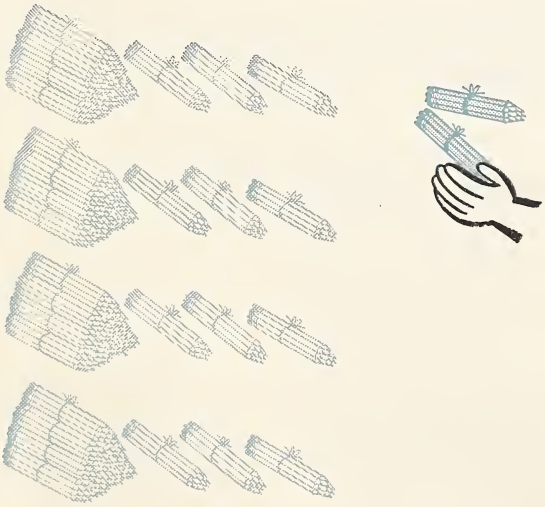
C

$$\begin{array}{r} 135 \\ -\ 4 \\ \hline 0 \end{array}$$

20 is 2 tens.
Write 0 here to show that there are no ones in the answer. ←

← Put the 2 new bundles of 10 pencils aside.

D

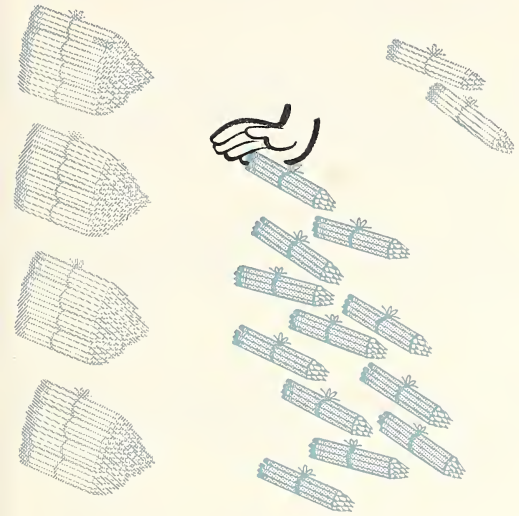


$$\begin{array}{r} 135 \\ -\ 4 \\ \hline 0 \end{array}$$

Remember the 2 new tens.

Now put the 4 groups of 30 pencils together.

E

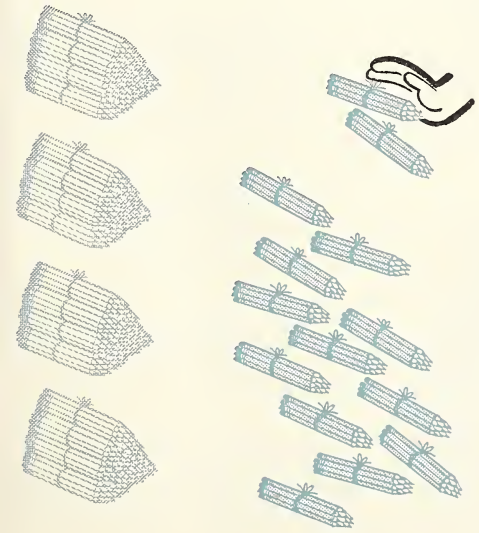


Multiply 30, or 3 tens, by 4.
There are 12 tens.

$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline 0 \end{array}$$

Put the 2 new bundles of 10 pencils with the 12 bundles of 10.

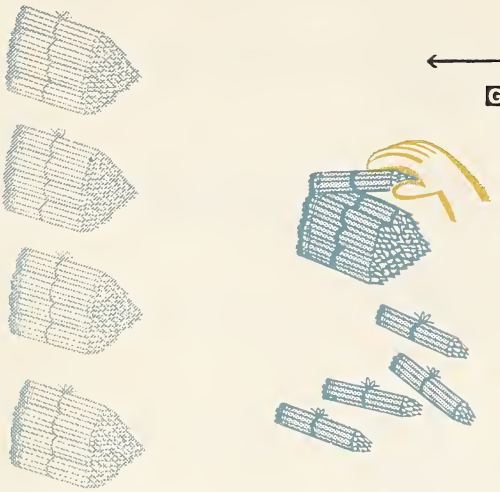
F



$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline 0 \end{array}$$

Remember to add the 2 new tens to the 12 tens.
Now there are 14 tens.

Now turn the page.



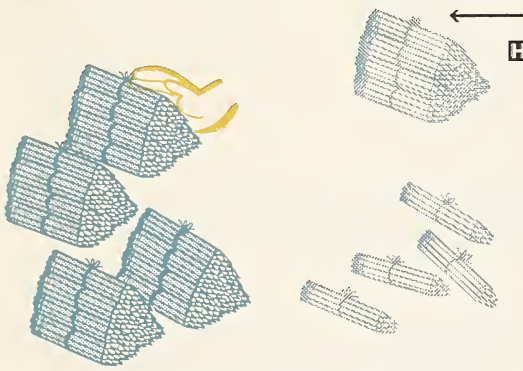
G

Make a new bundle of 100 pencils. There are 4 bundles of 10 left. Put the new bundle of 100 pencils aside.

$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline 40 \end{array}$$

14 tens equal 1 hundred 4 tens. Remember that you have a new hundred.

Write 4 here to show there are 4 tens in the answer.

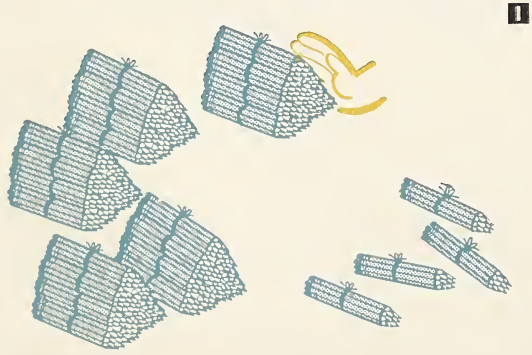


H

Put the 4 old bundles of 100 pencils together.

$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline 40 \end{array}$$

Multiply 100 by 4. There are 4 hundreds.



I

Put the new bundle of 100 with the other hundreds.

$$\begin{array}{r} 135 \\ \times\ \ 4 \\ \hline 540 \end{array}$$

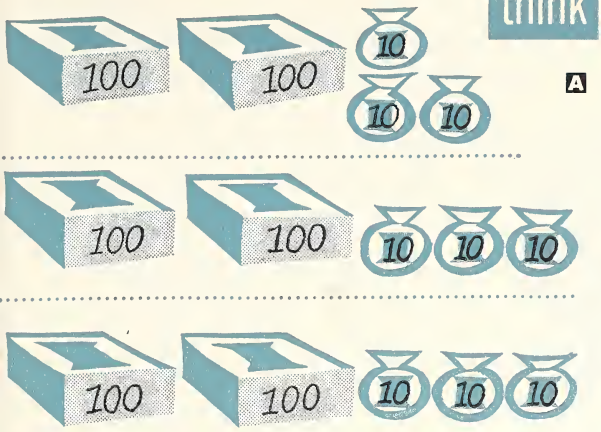
Remember to add the new hundred. Now there are 5 hundreds.

Write 5 here to show there are 5 hundreds.

The boys and girls use about 540 pencils in 4 weeks.

$4 \times 135 = 540$

think

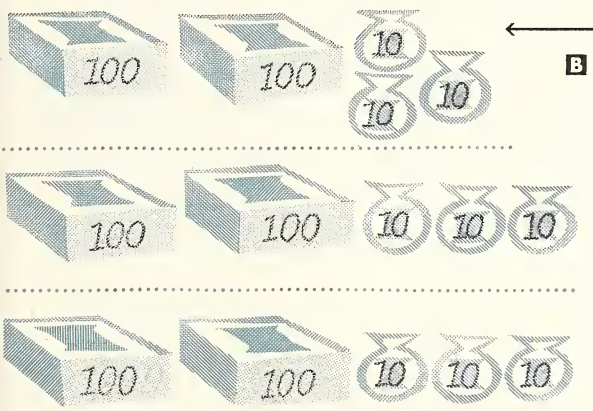


A

The fifth graders are collecting spools to use in making toys. Each of the 3 fifth-grade classes has promised to bring 230 spools to school. How many spools in all have they promised to bring?

$3 \times 230 = n$

You must find this number.

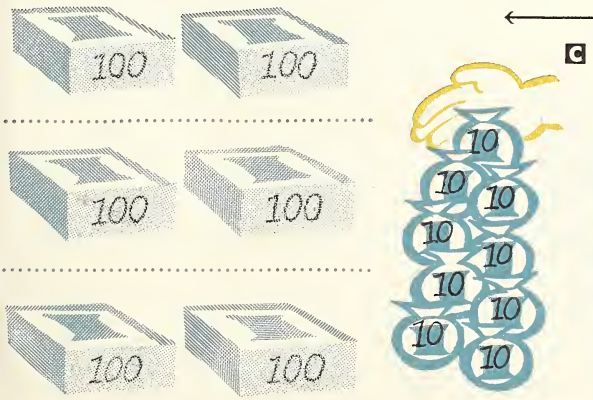


B

Are there any single spools to put together?

$$\begin{array}{r} 230 \\ -\ \ 3 \\ \hline 0 \end{array}$$

Why should you write 0 here?



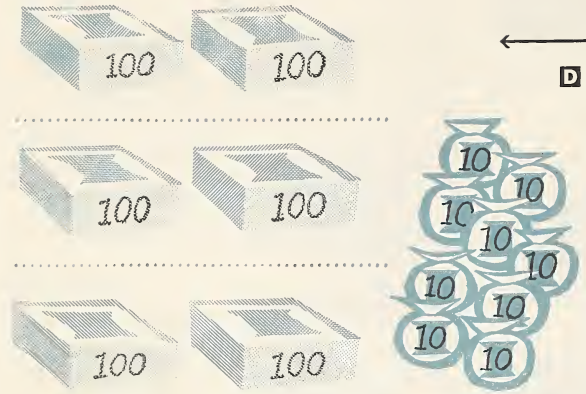
C

What do you put together first?

$$\begin{array}{r} 230 \\ -\ \ 3 \\ \hline 0 \end{array}$$

What must you do here to find how many tens there are?

Now turn the page.



Can you make a new box of 100 spools?

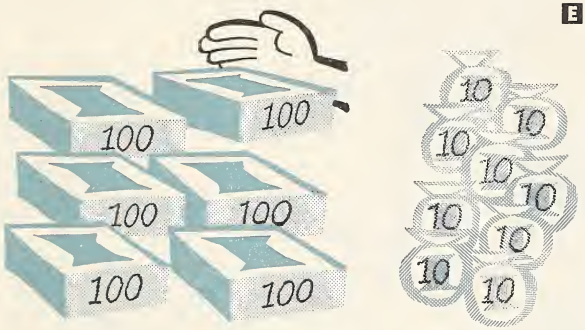
D

$$\begin{array}{r} 230 \\ \times\ \ 3 \\ \hline 90 \end{array}$$

Why should you write 9 here?

Now what do you put together?

E

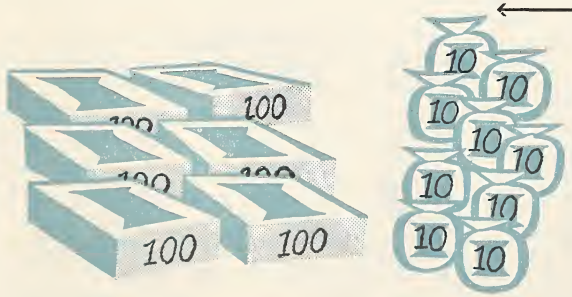


$$\begin{array}{r} 230 \\ \times\ \ 3 \\ \hline 690 \end{array}$$

What do you multiply now? How do you find how many hundreds there are?

Why do you write 6 in the answer?

F



The fifth graders have promised to bring ▒ spools.

$3 \times 230 = n$

try

A Mrs. Long says that if each of the 102 fifth graders brings 7 spools to school, there will be enough spools. How many spools does Mrs. Long need?
$102 \times 7 = n$

```
 102
   7   ← Multiply by the smaller number.
 714
```

B $9 \times 612 = n$

```
 612
   9
5508   ← Why does the answer have 4 figures?
```

C $5 \times \$3.21 = n$

```
$ 3.21
     5
$16.05   ← Put a point and a dollar sign in the answer.
```

D $927 \times 3 = n$

```
 927
   3
2781
```

do

A Mrs. Long sent Tony to the school storeroom to get 2 boxes of pencils. There were 144 pencils in each box. How many pencils in all was Tony to get?
$2 \times 144 = n$

B Tony saw 6 new boxes of tablets on a shelf in the storeroom. There were 144 tablets in each box. How many tablets in all were in the 6 boxes?
$6 \times 144 = n$

C $4 \times 136 = n$
D $5 \times 267 = n$
E $3 \times 491 = n$
F $604 \times 8 = n$
G $4 \times 554 = n$
H $386 \times 7 = n$
I $2 \times 738 = n$
J $9 \times 305 = n$
K $176 \times 6 = n$
L $5 \times 209 = n$

M $2 \times \$6.50 = n$
N $8 \times \$1.73 = n$
O $820 \times 5 = n$
P $2 \times 916 = n$
Q $7 \times \$2.05 = n$
R $447 \times 9 = n$
S $6 \times 703 = n$
T $598 \times 3 = n$
U $4 \times \$6.70 = n$
V $731 \times 8 = n$

A $322 \times 3 = n$
B $2 \times 897 = n$
C $349 \times 4 = n$
D $7 \times 607 = n$
E $543 \times 8 = n$
F $9 \times 259 = n$
G $6 \times 408 = n$
H $177 \times 5 = n$
I $708 \times 3 = n$
J $4 \times \$7.89 = n$

K $9 \times \$3.40 = n$
L $5 \times 806 = n$
M $183 \times 6 = n$
N $250 \times 9 = n$
O $3 \times \$7.30 = n$
P $7 \times \$2.48 = n$
Q $905 \times 4 = n$
R $8 \times \$3.15 = n$
S $9 \times 925 = n$
T $5 \times \$1.39 = n$

Now you should be able to multiply any three-figure number by any one-figure number.

Looking back

A

B

A 15 tens = 10 fifteens
$15 \times 10 = 150$
$10 \times 15 = 150$

B $10 \times 19 = 190$

C $10 \times 41 = 41\sim$

D $10 \times 62 = 62\sim$

E $10 \times 300 = 3000$

F $10 \times 540 = 540\sim$

G $10 \times 290 = 290\sim$

H $20 \times 17 = 340$

I $20 \times 31 = 62\sim$

J $40 \times 25 = 100\sim$

K $30 \times 140 = 420\sim$

A 15 hundreds = 100 fifteens
$15 \times 100 = 1500$
$100 \times 15 = 1500$

B $100 \times 26 = 2600$

C $100 \times 73 = 73\sim$

D $100 \times 49 = 49\sim$

E $100 \times 650 = 65000$

F $100 \times 817 = 817\sim$

G $300 \times 22 = 6600$

H $300 \times 31 = 93\sim$

I $200 \times 46 = 92\sim$

J $400 \times 16 = 64\sim$

K $200 \times 429 = 858\sim$

A $10 \times 52 = n$

B $20 \times 60 = n$

C $50 \times 33 = n$

D $20 \times 75 = n$

E $40 \times 40 = n$

F $60 \times 22 = n$

G $80 \times 39 = n$

H $100 \times 45 = n$

I $100 \times 60 = n$

J $200 \times 24 = n$

K $500 \times 28 = n$

L $700 \times 30 = n$

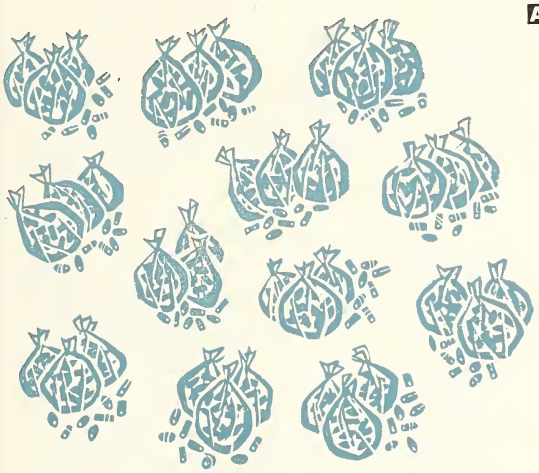
M $900 \times 43 = n$

Learning how

In this lesson you will learn how to multiply when the multipliers are numbers like 12, 54, or 76.

see

A



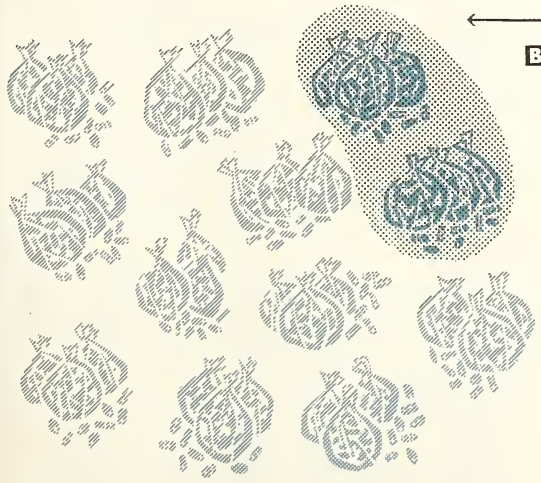
The 12 girls in the Tuesday Club are making paper beads for necklaces. Each girl will make 38 beads for her necklace. How many beads will the girls make for 12 necklaces?

$12 \times 38 = n$

You must find this number.

Think of 12 as 10 and 2.

B



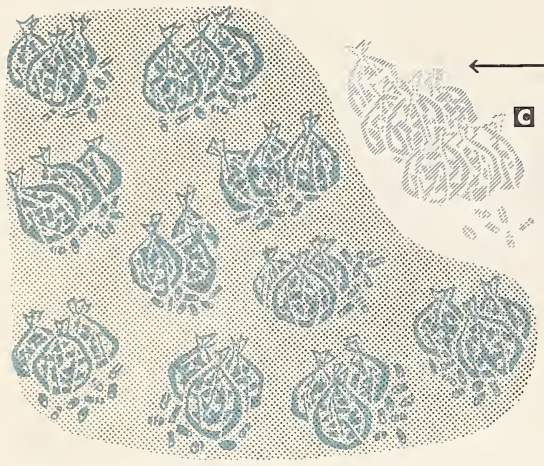
First find how many beads 2 of the girls will make. Imagine that 2 of the groups of 38 beads are being put together.

$$\begin{array}{r} 38 \\ \times\ 2 \\ \hline 76 \end{array}$$

First multiply 38 by 2.
$2 \times 38 = 76$

This number shows how many beads 2 girls will make.

Now turn the page.



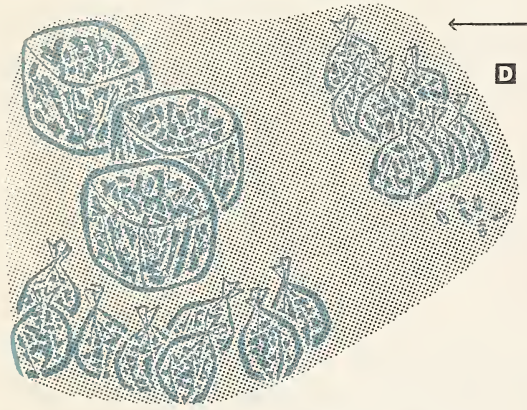
C

Now find how many beads 10 girls will make. Imagine that the 10 groups of 38 beads are put together.

$$\begin{array}{r} 38 \\ \times\ 10 \\ \hline 380 \end{array}$$

Multiply the 38 by 10.

$10 \times 38 = 380$. This number shows how many beads 10 girls will make.



D

To find how many beads in all the 12 girls will make, imagine that the beads made by 2 girls and by 10 girls are put together.

$$\begin{array}{r} 76 \\ +\ 380 \\ \hline 456 \end{array}$$

Add 76 and 380.

The sum of 76 and 380 is 456.

There are 456 beads in all.

E

$$\begin{array}{r} 38 \\ \times\ 12 \\ \hline 76 \\ 380 \\ \hline 456 \end{array}$$

You should write all of the work in one place, like this.

Beads 2 girls will make

Beads 10 girls will make

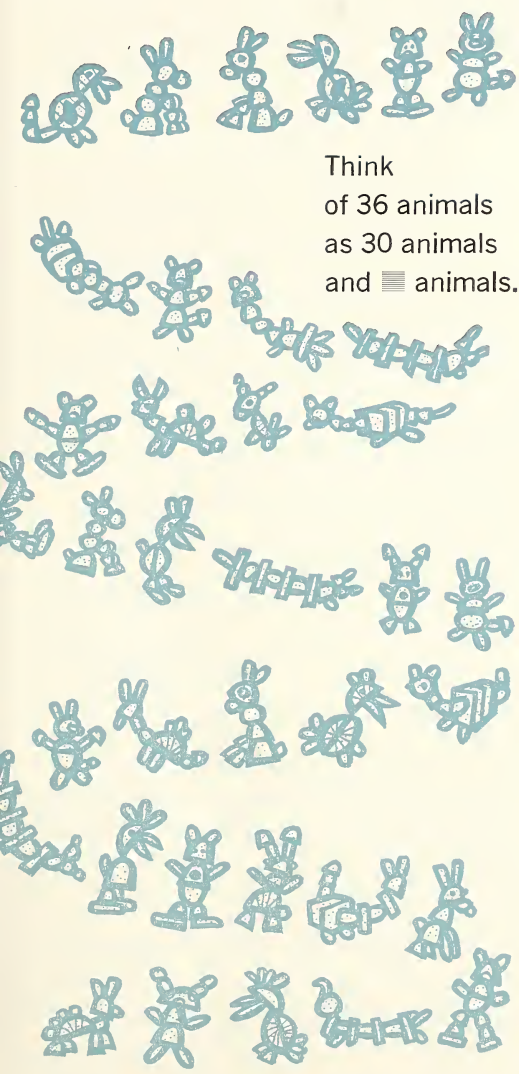
Beads all 12 girls will make

The girls will make 456 beads.

$12 \times 38 = 456$

think The girls in the Tuesday Club made 36 animals of gumdrops. They used 14 gumdrops for each animal. How many gumdrops in all did they use?

$36 \times 14 = n$



Think of 36 animals as 30 animals and ▒ animals.

14
36 ← First multiply 14 by ▒.

First find the number of gumdrops in ▒ animals.

14
36
84 ← in ▒ animals.

$6 \times 14 =$ ▒. 84 shows the number of gumdrops

14
36
84

Now find the number of gumdrops in ▒ animals.

14
36 ← Multiply ▒ by 30.
84

14
36
84
420 ← there were in ▒ animals.

$30 \times 14 =$ ▒. Write ▒ under 84 so that you can ⌒. 420 shows how many gumdrops

14
36
84 ⌐
420 ⌙ Now find the total number of gumdrops in 36 animals. How do you do this?
504 ← $84 + 420 =$ ▒

The girls used ▒ gumdrops in all.

try

A Each of the 12 girls in the Tuesday Club pays dues of $.15 each month. How much money do they pay in all in dues each month?
$12 \times \$.15 = n$

$\$.15$
12 ← Think of 12 as 10 and 2.
$.30$ ← Dues paid by ▒ girls.
1.50 ← Dues paid by ▒ girls.
$\$1.80$ ← Dues paid by ▒ girls. Use a point and dollar sign here.

B $58 \times 84 = n$

84
58
672
4200
4872

C $162 \times 43 = n$

162
43
486 ← 3×162
6480 ← 40×162
6966

D $35 \times \$8.06 = n$

$8.06
35
40.30
241.80
$282.10

You do not need to put a point in these numbers.

do

A Mary wanted to make 24 place mats of strips of paper. She needed 19 strips for each place mat. How many strips did she need in all?
$24 \times 19 = n$

B Mrs. Fisher bought 12 packages of colored paper for the girls. The paper cost $.35 per package. How much did all the paper cost?
$12 \times \$.35 = n$

C $34 \times 76 = n$
D $29 \times 55 = n$
E $63 \times 82 = n$
F $18 \times 78 = n$
G $41 \times 95 = n$
H $36 \times \$.24 = n$
I $53 \times \$.65 = n$
J $75 \times \$.80 = n$
K $23 \times 77 = n$

L $48 \times 201 = n$
M $416 \times 92 = n$
N $64 \times 330 = n$
O $56 \times \$1.49 = n$
P $40 \times \$3.03 = n$
Q $507 \times 72 = n$
R $86 \times 449 = n$
S $502 \times 61 = n$
T $90 \times 600 = n$

A $58 \times 49 = n$
B $37 \times 61 = n$
C $66 \times \$.75 = n$
D $23 \times 49 = n$
E $70 \times \$.54 = n$
F $16 \times 86 = n$
G $94 \times 94 = n$
H $49 \times \$.50 = n$
I $15 \times 628 = n$

J $40 \times 305 = n$
K $22 \times \$2.57 = n$
L $84 \times 173 = n$
M $36 \times 508 = n$
N $57 \times \$1.92 = n$
O $81 \times 670 = n$
P $65 \times \$7.40 = n$
Q $560 \times 85 = n$
R $45 \times 892 = n$

Now you should be able to multiply by numbers with two figures in them.

Using arithmetic

A The girls in the Tuesday Club collect $1.80 a month in dues. How much do they collect in dues in 6 months?

B When the girls had collected $3.60 in dues, they planned a party. They needed $5 in all for the party. How much more money did they need?

C Mrs. Young and Mrs. Block each gave the club $.75 to help pay for the party. How much money in all did they give the club?

D The girls made 36 invitations to the party. The invitations were made by 4 girls. Each girl made the same number of invitations. How many did each girl make?

E Twenty-eight persons said they could come to the party. The rest were not able to come. How many were not able to come?

F The girls planned to make 28 party favors out of pipe cleaners. They needed 4 pipe cleaners for each favor. How many pipe cleaners did they need for all the favors?

G Seven girls said they would make all the favors. Each girl was to make the same number of favors. How many was each girl to make?

H Five girls said they would make all the sandwiches. How many sandwiches should they make so that each of the 28 persons at the party could have 3?

I Mrs. Young taught the girls to make paper flowers. Each girl needed 6 petals for one flower. How many petals would all 12 girls need if each girl made just one flower?

J Each girl made 8 flowers. How many flowers in all did the girls make?

K How many petals did the girls need for all the flowers they made?

L Mrs. Block promised to teach the girls to sew. Each of the 12 girls bought one yard of cloth. The cloth cost $.39 a yard. How much did all the cloth cost?

M Nine boys had a club, too. Each boy paid 20¢ a month in dues. How much was collected in dues each month?

N Mrs. Baker let the boys meet in the Bakers' basement. The boys planned to use orange crates to separate their corner of the basement from the rest of the basement. They needed 14 crates for each wall that they built. How many crates did they need for the 2 walls?

O The boys got 13 orange crates from a grocery store and 18 orange crates from a fruit store. How many crates did they get from the 2 stores?

P Dick's father gave the boys an old record player. Dick, Paul, and Bill promised to bring 8 records each. How many records in all did they promise to bring?

Q Mr. Baker helped the 9 boys build safes for storing their collections. Each boy needed 18 small boxes to use as drawers in his safe. How many boxes in all were needed?

R For a long time the boys saved small boxes. Tony and Don brought 19 boxes to one club meeting. They said, "Now we have 70 boxes." How many boxes did they have before Tony and Don brought the 19 boxes?

S How many more boxes did the boys need so that they could finish their safes?

T Tony's father gave the boys some money to buy paint for the safes. After the boys had spent $2.41 for paint, they had $.59 left. How much money had Tony's father given them?

Checking up

Test 1	Test 2	Test 3	Test 4
A $4 \times 97 = n$	A $26 \times 41 = n$	A $14 \times 321 = n$	A $7 \times \$.28 = n$
B $2 \times 740 = n$	B $38 \times 55 = n$	B $208 \times 35 = n$	B $4 \times \$1.76 = n$
C $5 \times 391 = n$	C $15 \times 80 = n$	C $156 \times 26 = n$	C $8 \times \$.94 = n$
D $86 \times 7 = n$	D $44 \times 39 = n$	D $42 \times 315 = n$	D $6 \times \$.65 = n$
E $9 \times 48 = n$	E $23 \times 75 = n$	E $60 \times 527 = n$	E $3 \times \$4.09 = n$
F $3 \times 625 = n$	F $68 \times 36 = n$	F $36 \times 450 = n$	F $2 \times \$7.83 = n$
G $279 \times 6 = n$	G $70 \times 42 = n$	G $703 \times 18 = n$	G $13 \times \$.48 = n$
H $8 \times 153 = n$	H $19 \times 28 = n$	H $51 \times 448 = n$	H $35 \times \$.61 = n$
I $460 \times 5 = n$	I $57 \times 62 = n$	I $74 \times 625 = n$	I $42 \times \$1.04 = n$
J $6 \times 87 = n$	J $25 \times 76 = n$	J $304 \times 59 = n$	J $29 \times \$.77 = n$
K $9 \times 309 = n$	K $84 \times 84 = n$	K $86 \times 119 = n$	K $16 \times \$2.18 = n$
L $512 \times 7 = n$	L $62 \times 95 = n$	L $587 \times 63 = n$	L $73 \times \$3.46 = n$
M $899 \times 3 = n$	M $34 \times 96 = n$	M $270 \times 92 = n$	M $80 \times \$5.20 = n$
N $8 \times 207 = n$	N $78 \times 78 = n$	N $55 \times 864 = n$	N $5 \times \$8.40 = n$
O $4 \times 93 = n$	O $45 \times 87 = n$	O $28 \times 909 = n$	O $96 \times \$.85 = n$

Thinking straight

A

B

A Did Paul or Sally pick more oranges? Explain your answer.

B When might you want to count oranges?

C When might you want to weigh oranges?

D Paul picked 6 very large grapefruit. Sally picked 6 small grapefruit. Did Sally pick as many grapefruit as Paul? Did she pick as much grapefruit as Paul? Explain your answer.

E Carol bought a bag of candy with 25 pieces in it. Kathy bought 5 candy bars. What do you have to know before you can tell who bought less candy?

F Dick bought 10 apples. George bought 4 lb. of apples. What do you have to know before you can tell who bought more apples?

G Mrs. Fisher bought 1 bottle of milk. Mrs. Long bought 3 bottles of milk. Who bought fewer bottles? Who bought less milk? How do you know?

H Oranges are often sold by the dozen, but berries are sold by the pint or quart. Why?

I Name some things that are often sold by the dozen.

J Is it better to count things or to measure things? Explain your answer.

K How many different ways of measuring do you know about?

L What words are used for counting things?

M What words are used for measuring things?

Learning how

In this lesson you will learn how to divide when the answer has two figures.

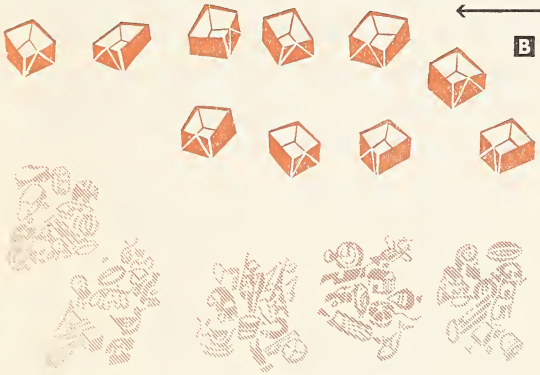
see

A

Kathy is making surprise packages for the grab bag at a Toy Fair. She has 50 small toys. She wants to put 3 toys in each box. How many boxes of 3 toys will she have? Will any toys be left over?

$50 \div 3 = n$ ← You must find this number.

B



← Let us start with 10 boxes of 3 toys.

$3\overline{)50}\,|\,10$ ← We will start with 10 groups of 3 toys.

C

← To fill 10 boxes, we will use 10×3, or 30 toys.

$3\overline{)50}\,|\,10$

$\underline{30}$ ←

$10 \times 3 = 30$. We write 30 here so that we can subtract it from 50 to find how many toys are left to be put into boxes.

How many toys are left to be put into boxes?

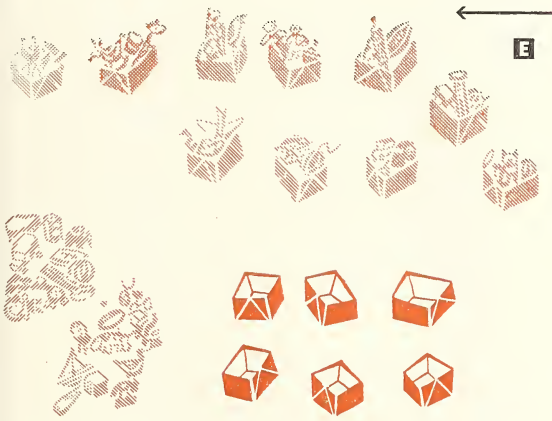
D

$$\begin{array}{r|l} 3\overline{)50} & 10 \\ 30 & \\ \hline 20 & \end{array}$$

There are 20 toys left.

There are about 6 threes in 20.
Let us try 6 more boxes of 3 toys.

E

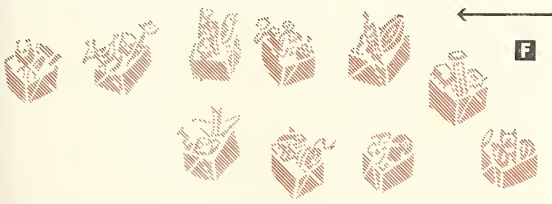


$$\begin{array}{r|l} 3\overline{)50} & 10 \\ 30 & \\ \hline 20 & 6 \end{array}$$

We will use 6 more groups of 3 toys.

We have used 6×3, or 18 more toys.

F



$$\begin{array}{r|l} 3\overline{)50} & 10 \\ 30 & \\ \hline 20 & 6 \\ 18 & \\ \hline \end{array}$$

$6 \times 3 = 18$.
We write 18 here so that we can subtract to find how many toys are left.

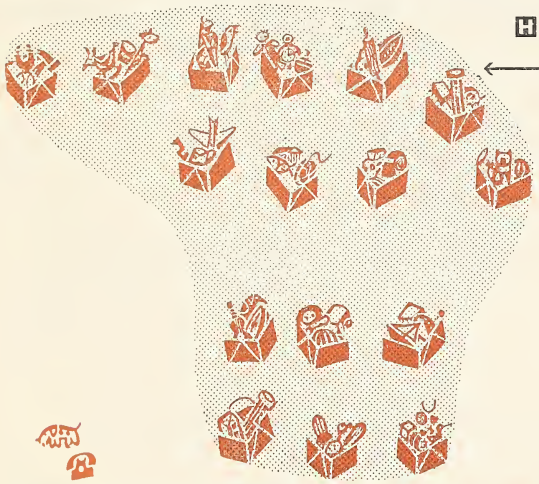
Now turn the page.

There are only 2 toys left over.

G

$$3\overline{)50}\ \begin{array}{l|l} 30 & 10 \\ \hline 20 & 6 \\ 18 & \\ \hline 2 & \end{array}$$

When we subtract, there is a remainder of 2.



H

There will be 16 boxes of 3 toys.
There will be 2 toys left over.

$$3\overline{)50}\ \begin{array}{l|l} 30 & 10 \\ \hline 20 & 6 \\ 18 & \\ \hline 2 & 16 \end{array}$$

Add 10 and 6.

There will be 16 boxes of 3 toys.

2 toys will be left over.

$50 \div 3 = 16$ and 2 remainder

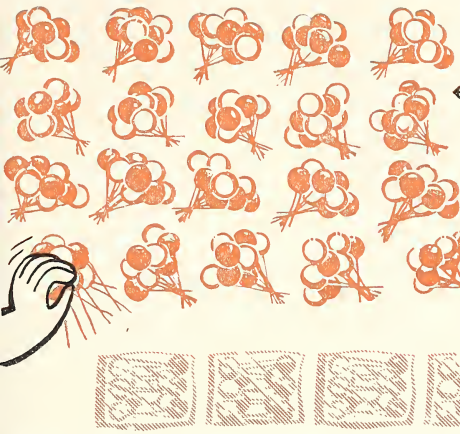
think

A

Sue has 200 lollipops. She is going to divide them into bunches of 8. How many bunches will she have? Will any lollipops be left over?

$200 \div 8 = n$

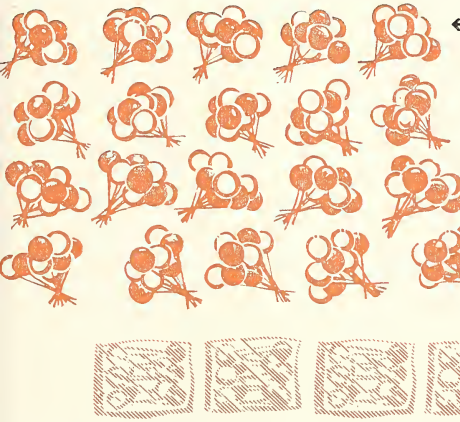
You must find this number.



How many bunches of 8 do you try at first?

B

$8\overline{)200}\ 20$ ← First try ▒ eights.

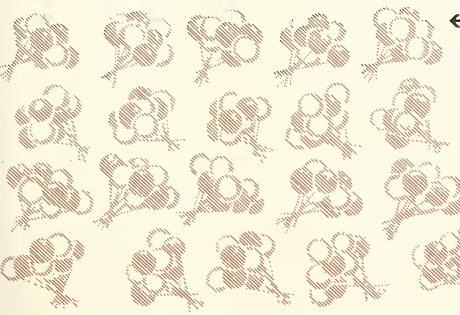


You have used 20 × ▒, or ▒ lollipops.

C

$8\overline{)200}\ 20$

160 ← How do you get 160? Why is the 160 written here?



How many lollipops are left to be put in bunches of 8?

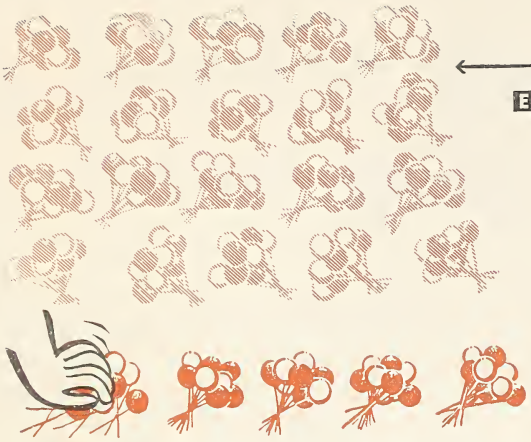
D

$8\overline{)200}\ 20$

160

40 ← How do you get 40? What does the 40 show?

Now turn the page.



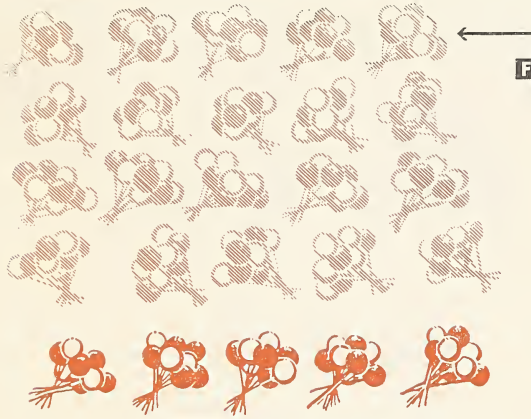
How many bunches of 8 can be made from 40 lollipops?

E

$$\begin{array}{r|l} 8\overline{)200} & 20 \\ 160 & \\ \hline 40 & 5 \end{array}$$

Why can you use 5 here?

How many lollipops have you used this time?



F

$$\begin{array}{r|l} 8\overline{)200} & 20 \\ 160 & \\ \hline 40 & 5 \\ 40 & \\ \hline & \end{array}$$

How do you get this 40?

How many bunches of 8 lollipops will there be? Will any be left over?

G

$$\begin{array}{r|l} 8\overline{)200} & 20 \\ 160 & \\ \hline 40 & 5 \\ 40 & \\ \hline & 25 \end{array}$$

What do you do now?

What does the 25 mean? Is there a remainder?

$200 \div 8 = n$

try

A $378 \div 5 = n$

378	20
100	
278	40
200	
78	10
50	
28	5
25	
3	75

378	30
150	
228	20
100	
128	20
100	
28	5
25	
3	75

378	50
250	
128	20
100	
28	5
25	
3	75

378	70
350	
28	5
25	
3	75

$378 \div 5 = n$

B $621 \div 9 = n$

621	10
90	
531	30
270	
261	20
180	
81	9
81	
	69

621	20
180	
441	20
180	
261	20
180	
81	9
81	
	69

621	50
450	
171	10
90	
81	9
81	
	69

621	60
540	
81	9
81	
	69

$621 \div 9 = n$

C $141 \div 2 = n$

141	20
40	
101	50
100	
1	70

141	40
80	
61	30
60	
1	70

141	10
20	
121	60
120	
1	70

141	70
140	
1	

$141 \div 2 = n$

Now turn the page.

D $322 \div 7 = n$

$7\overline{)322}$ 10, 70, 252, 20, 140, 112, 10, 70, 42, 6, 42, 46

$7\overline{)322}$ 20, 140, 182, 20, 140, 42, 6, 42, 46

$7\overline{)322}$ 10, 70, 252, 30, 210, 42, 6, 42, 46

$7\overline{)322}$ 40, 280, 42, 6, 42, 46

$322 \div 7 = n$

---

do

A Tom said that he sold 85¢ worth of balloons when he helped at the Toy Fair. The balloons were sold for 5¢ each. How many balloons did Tom sell?
$85 \div 5 = n$

B The sixth-grade boys and girls made 28 cardboard signs for the Toy Fair. They made 2 signs from each piece of cardboard. How many pieces of cardboard did they use for the signs?
$28 \div 2 = n$

C $106 \div 4 = n$
D $78 \div 6 = n$
E $95 \div 7 = n$
F $138 \div 9 = n$
G $240 \div 7 = n$
H $72 \div 2 = n$
I $306 \div 8 = n$
J $200 \div 3 = n$
K $91 \div 4 = n$
L $162 \div 6 = n$

M $430 \div 5 = n$
N $679 \div 8 = n$
O $121 \div 3 = n$
P $380 \div 4 = n$
Q $720 \div 9 = n$
R $364 \div 6 = n$
S $523 \div 7 = n$
T $87 \div 3 = n$
U $546 \div 8 = n$
V $801 \div 9 = n$

A $93 \div 8 = n$
B $58 \div 2 = n$
C $213 \div 6 = n$
D $290 \div 4 = n$
E $382 \div 7 = n$
F $148 \div 2 = n$
G $240 \div 5 = n$
H $97 \div 9 = n$
I $488 \div 6 = n$
J $271 \div 3 = n$

K $92 \div 5 = n$
L $150 \div 3 = n$
M $196 \div 4 = n$
N $450 \div 8 = n$
O $591 \div 7 = n$
P $266 \div 9 = n$
Q $192 \div 6 = n$
R $323 \div 4 = n$
S $434 \div 5 = n$
T $600 \div 7 = n$

Now you should be able to divide when the answer has two figures.

Using arithmetic

A The boys and girls decorated the gym for the Toy Fair. They used 27 packages of crepe paper. They cut the paper in each package into 12 strips. How many strips did they have altogether?

B They wanted to use the same number of strips of crepe paper to decorate each of the 4 walls of the gym. How many strips could they use on each wall?

C The gym was 94 feet long and 50 feet wide. The gym was how much longer than it was wide?

D The boys and girls decorated the tables with balloons. They used 108 balloons for 9 tables. They put the same number on each table. How many did they put on each table?

E The boys were going to make toy wagons to sell. They had 56 little wheels to use. They needed 4 wheels for each wagon. How many wagons could they make?

F The children also mended old toys to sell. They mended some one day. The next day they mended 18 more. Dick said, "Now we have mended 36 toys." How many toys did they mend the first day?

G They put the 70 toys they had made on one table and the 36 toys they had mended on another table. How many were on the two tables?

H The children had mended how many fewer toys than they had made?

I Three stores gave 120 new toys to be sold at the Toy Fair. Each store gave the same number of toys. How many toys did each store give?

J At 9 o'clock in the morning there were 95 packages in the grab bag. At noon 47 packages were left. How many packages had been sold between 9 o'clock and noon?

K The grab-bag packages sold for 15¢ each. How much did the children hope to get by selling all 95 packages?

L Five mothers said they would make 200 popcorn balls to sell at the fair. Each mother was to make the same number. How many popcorn balls would each mother make?

M They sold the popcorn balls at 6¢ each. How much money did they hope to get for the 200 popcorn balls?

N Ann sold 75 popcorn balls in the morning. How many popcorn balls were still to be sold in the afternoon?

O After Bill Fuller had spent 35¢ for a toy boat at the fair, he still had 29¢ left to spend. How much money had he had altogether to spend at the fair?

P Mrs. Fisher spent $2.50 for toys and $.72 for popcorn balls. How much did she spend in all?

Q How many popcorn balls did Mrs. Fisher buy with the 72¢?

R The girls had wrapped 58 of the 95 packages for the grab bag on one day. They wrapped the rest of the packages the next day. How many grab-bag packages did they wrap on the second day?

S Susan paid 64¢ for 4 toy horses at the fair. How much did each of the toy horses cost?

T Tony spent 35¢ for a toy wagon, 12¢ for popcorn balls, and 15¢ for a grab-bag package. How much did he spend for all three of these things?

U Mary and June Fuller each had 85¢ to spend at the fair. How much did both girls have to spend?

V Of the 226 toys the boys and girls had to sell, they sold only 194. How many toys were not sold?

W Only 87 of the grab-bag packages were sold. How much money was collected for these packages?

X The boys and girls had spent $36.67 for materials for the fair. They collected $92.75 for the things they sold. How much money was left after the materials were paid for?

Keeping skillful

A	$731 + 426 = n$	**A**	$n + 84 = 107$	**A**	$3 \times 87 = n$
B	$82 + 43 + 70 = n$	**B**	$336 + n = 600$	**B**	$7 \times 105 = n$
C	$292 + 688 = n$	**C**	$528 - n = 175$	**C**	$9 \times 76 = n$
D	$333 + 509 + 621 = n$	**D**	$n - 92 = 234$	**D**	$5 \times 226 = n$
E	$197 + 76 + 209 = n$	**E**	$514 - 223 = n$	**E**	$304 \times 6 = n$
F	$7865 + 4958 = n$	**F**	$n - 476 = 528$	**F**	$41 \times 67 = n$
G	$26 + 45 + 50 = n$	**G**	$3071 + n = 4000$	**G**	$25 \times 53 = n$
H	$36 + 18 + 23 = n$	**H**	$56263 - 24987 = n$	**H**	$92 \times 8 = n$
I	$904 + 775 + 562 + 384 = n$	**I**	$n + 858 = 1016$	**I**	$54 \times 78 = n$
J	$53 + 421 + 540 + 87 = n$	**J**	$5108 - n = 2329$	**J**	$36 \times 209 = n$
K	$382 + 150 + 639 + 229 = n$	**K**	$17568 - 4392 = n$	**K**	$372 \times 65 = n$

Thinking straight

A $610 \div 8 = n$

$8\overline{)610}\ \overline{70}$ ← 61 tens ÷ 8 = about 7 tens. Try 70 in the answer.

$\underline{560}$

B $357 \div 6 = n$

$6\overline{)357}\ \overline{50}$ ← 35 tens ÷ ▒ = about ▒ tens. Try ▒ in the answer.

$\underline{300}$

In Example C below, 30 is the largest number ending in 0 that can be used to get the answer. For each of the Examples D to P, find the largest number ending in 0 that can be used to find the answer.

C $105 \div 3 = n$
D $429 \div 5 = n$
E $262 \div 7 = n$
F $313 \div 4 = n$
G $628 \div 9 = n$
H $225 \div 4 = n$
I $271 \div 6 = n$
J $830 \div 9 = n$
K $544 \div 8 = n$
L $77 \div 2 = n$
M $618 \div 7 = n$
N $276 \div 3 = n$
O $125 \div 5 = n$
P $190 \div 6 = n$

Keeping skillful

A $243 \times 628 = n$

628 — First multiply by ▒.
243 ← Then multiply by ▒. Then multiply by 200.

1884
25120
125600 ← How do you get this number?
152604 ← How do you get this number?

B $405 \times 537 = n$

537 — First multiply by ▒.
405 ← Then multiply by ▒.

2685
214800
217485

C $136 \times 472 = n$
D $170 \times 648 = n$
E $204 \times 339 = n$
F $310 \times 742 = n$
G $443 \times 528 = n$
H $290 \times 650 = n$
I $507 \times 809 = n$
J $365 \times 675 = n$
K $712 \times 880 = n$
L $629 \times 795 = n$
M $308 \times 926 = n$
N $545 \times 586 = n$
O $243 \times 106 = n$
P $640 \times 392 = n$
Q $158 \times 933 = n$
R $745 \times 770 = n$

Learning how

This lesson shows how to divide by a number that has two figures.

see

A

George has saved 864 pennies. He is wrapping them in rolls of 50 to take to the bank. How many rolls of 50 will he have? How many pennies will be left?

$$864 \div 50 = n$$

You must find this number.

B

Start by making 10 rolls of pennies. For 10 rolls you will use 500 pennies.

$$\begin{array}{r|l} 50\overline{)864} & 10 \\ 500 & \end{array}$$

Start with 10 groups of 50 pennies.

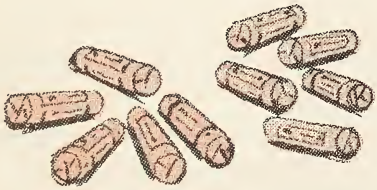
$50 \times 50 = 500$. Write 500 here so that you can subtract to find how many pennies are left.

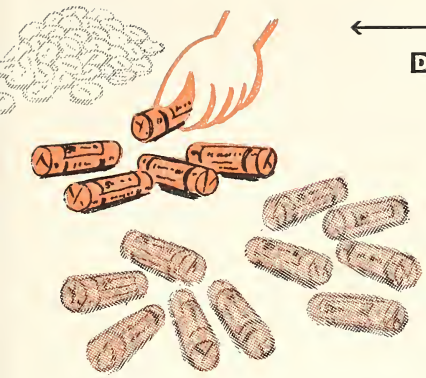
C

Some pennies are left to be wrapped in rolls.

$$\begin{array}{r|l} 50\overline{)864} & 10 \\ 500 & \\ \hline 364 & \end{array}$$

364 pennies are left.





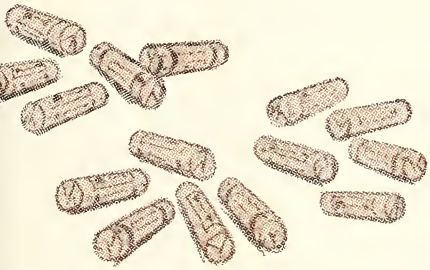
D

Try 5 more rolls of pennies. For 5 rolls you will use 250 pennies.

```
50)864 | 10
   500
   364 |  5   ← Try 5 more groups of 50 pennies.
   250
   114      ← 5 × 50 = 250. Write 250 here so that you can subtract.
```

E

There are still some pennies left.



```
50)864 | 10
   500
   364 |  5
   250
   114      ← 114 pennies are left.
```

F

Try 2 more rolls of pennies. For 2 rolls you will use 100 pennies.

```
50)864 | 10
   500
   364 |  5
   250
   114 |  2   ← Try 2 more groups of 50.
   100      ← 2 × 50 = 100. Write 100.
```

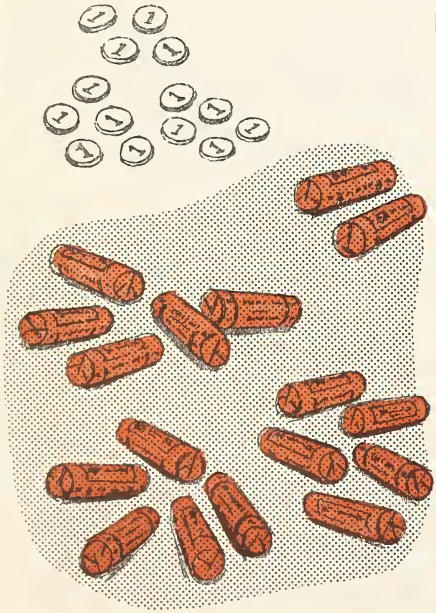
Now turn the page.

Only 14 pennies are left. That is not enough for another roll of 50 pennies.

G

$$\begin{array}{r|l} 50\overline{)864} & 10 \\ 500 & \\ \hline 364 & 5 \\ 250 & \\ \hline 114 & 2 \\ 100 & \\ \hline 14 & \end{array}$$

You cannot try another group of 50. There is a remainder of 14.



There will be 17 rolls of 50 pennies. 14 pennies will be left over.

H

$$\begin{array}{r|l} 50\overline{)864} & 10 \\ 500 & \\ \hline 364 & 5 \\ 250 & \\ \hline 114 & 2 \\ 100 & \\ \hline 14 & 17 \end{array}$$

Add 10, 5, and 2.

There will be 17 rolls of 50 pennies.

14 pennies will be left over.

$864 \div 50 = 17$ and 14 remainder

think Paul has 650 new stamps for his collection. Each page of his stamp book holds 24 stamps. How many pages can he fill with 650 stamps? Will any stamps be left over?

$650 \div 24 = n$ ← You must find this number.

A Start by filling 20 pages.
For 20 pages you will use 20 × ▒, or ▒ stamps.

$$\begin{array}{r|l} 24\overline{)650} & 20 \\ 480 & \end{array}$$

First try ▒ twenty-fours.

← $20 \times$ ▒ $= 480$. Why do you write 480 here?

B How many stamps are left?

$$\begin{array}{r|l} 24\overline{)650} & 20 \\ 480 & \\ \hline 170 & \end{array}$$

How do you get 170? What does the 170 show?

C How do you know that you can fill 7 more pages? You will use ▒ × 24, or ▒ more stamps.

$$\begin{array}{r|l} 24\overline{)650} & 20 \\ 480 & \\ \hline 170 & 7 \\ 168 & \end{array}$$

Now try ▒ more twenty-fours.

How do you get 168?

D Are there enough stamps left to fill another page?

$$\begin{array}{r|l} 24\overline{)650} & 20 \\ 480 & \\ \hline 170 & 7 \\ 168 & \\ \hline 2 & \end{array}$$

← There is a remainder of ▒.

E How many pages of 24 stamps will there be? How many stamps will be left?

$$\begin{array}{r|l} 24\overline{)650} & 20 \\ 480 & \\ \hline 170 & 7 \\ 168 & \\ \hline 2 & 27 \end{array}$$

What do you do now?

There will be ▒ full pages of stamps.

▒ stamps will be left.

$650 \div 24 = 27$ and ▒ remainder

try

A $703 \div 18 = n$

18) 703	10
180	
523	10
180	
343	10
180	
163	5
90	
73	3
54	
19	1
18	
1	39

18) 703	20
360	
343	10
180	
163	5
90	
73	2
36	
37	2
36	
1	39

18) 703	20
360	
343	10
180	
163	8
144	
19	1
18	
1	39

18) 703	30
540	
163	9
162	
1	39

$703 \div 18 = n$

B $5148 \div 63 = n$

63) 5148	20
1260	
3888	20
1260	
2628	20
1260	
1368	20
1260	
108	1
63	
45	81

63) 5148	30
1890	
3258	40
2520	
738	10
630	
108	1
63	
45	81

63) 5148	50
3150	
1998	20
1260	
738	10
630	
108	1
63	
45	81

63) 5148	80
5040	
108	1
63	
45	81

$5148 \div 63 = n$

C $1330 \div 35 = n$

$$
\begin{array}{r|l}
35\overline{)1330} & 10 \\
\underline{350} & \\
980 & 20 \\
\underline{700} & \\
280 & 5 \\
\underline{175} & \\
105 & 3 \\
\underline{105} & \\
 & 38
\end{array}
\qquad
\begin{array}{r|l}
35\overline{)1330} & 10 \\
\underline{350} & \\
980 & 10 \\
\underline{350} & \\
630 & 10 \\
\underline{350} & \\
280 & 8 \\
\underline{280} & \\
 & 38
\end{array}
\qquad
\begin{array}{r|l}
35\overline{)1330} & 20 \\
\underline{700} & \\
630 & 10 \\
\underline{350} & \\
280 & 4 \\
\underline{140} & \\
140 & 4 \\
\underline{140} & \\
 & 38
\end{array}
\qquad
\begin{array}{r|l}
35\overline{)1330} & 30 \\
\underline{1050} & \\
280 & 8 \\
\underline{280} & \\
 & 38
\end{array}
$$

$1330 \div 35 = n$

D $609 \div 15 = n$

$$
\begin{array}{r|l}
15\overline{)609} & 10 \\
\underline{150} & \\
459 & 10 \\
\underline{150} & \\
309 & 20 \\
\underline{300} & \\
9 & 40
\end{array}
\qquad
\begin{array}{r|l}
15\overline{)609} & 20 \\
\underline{300} & \\
309 & 20 \\
\underline{300} & \\
9 & 40
\end{array}
\qquad
\begin{array}{r|l}
15\overline{)609} & 10 \\
\underline{150} & \\
459 & 30 \\
\underline{450} & \\
9 & 40
\end{array}
\qquad
\begin{array}{r|l}
15\overline{)609} & 40 \\
\underline{600} & \\
9 &
\end{array}
$$

$609 \div 15 = n$

E $448 \div 56 = n$

$$
\begin{array}{r|l}
56\overline{)448} & 2 \\
\underline{112} & \\
336 & 4 \\
\underline{224} & \\
112 & 2 \\
\underline{112} & \\
 & 8
\end{array}
\qquad
\begin{array}{r|l}
56\overline{)448} & 4 \\
\underline{224} & \\
224 & 4 \\
\underline{224} & \\
 & 8
\end{array}
\qquad
\begin{array}{r|l}
56\overline{)448} & 5 \\
\underline{280} & \\
168 & 2 \\
\underline{112} & \\
56 & 1 \\
\underline{56} & \\
 & 8
\end{array}
\qquad
\begin{array}{r|l}
56\overline{)448} & 8 \\
\underline{448} & \\
 &
\end{array}
$$

$448 \div 56 = n$

do

A Kathy has made 84 cookies. She wonders how many dozen cookies she has made. She has made how many dozen cookies?
$84 \div 12 = n$

B The Fishers are going to make 80 sandwiches. Mrs. Fisher says that they can make 20 sandwiches from 1 loaf of bread. How many loaves of bread will they need?
$80 \div 20 = n$

C $641 \div 27 = n$
D $968 \div 46 = n$
E $420 \div 84 = n$
F $750 \div 58 = n$
G $220 \div 31 = n$
H $728 \div 14 = n$
I $839 \div 75 = n$
J $862 \div 22 = n$
K $540 \div 60 = n$
L $138 \div 49 = n$
M $304 \div 73 = n$

N $4240 \div 80 = n$
O $1218 \div 37 = n$
P $901 \div 53 = n$
Q $485 \div 69 = n$
R $300 \div 26 = n$
S $390 \div 78 = n$
T $119 \div 17 = n$
U $95 \div 40 = n$
V $231 \div 88 = n$
W $6043 \div 71 = n$
X $1599 \div 39 = n$

A $324 \div 8 = n$
B $116 \div 2 = n$
C $408 \div 5 = n$
D $226 \div 3 = n$
E $521 \div 7 = n$
F $840 \div 9 = n$
G $265 \div 5 = n$
H $432 \div 6 = n$
I $360 \div 4 = n$
J $736 \div 8 = n$
K $443 \div 7 = n$

L $1125 \div 45 = n$
M $561 \div 92 = n$
N $135 \div 33 = n$
O $2342 \div 56 = n$
P $299 \div 21 = n$
Q $5740 \div 70 = n$
R $1000 \div 16 = n$
S $1116 \div 93 = n$
T $637 \div 79 = n$
U $124 \div 13 = n$
V $5490 \div 61 = n$

Now you should be able to divide by any number that has two figures.

Using arithmetic

A One day 15 girls in the 4-H Club canned 6 bushels of tomatoes. Mrs. White told them they would get about 26 quarts of canned tomatoes from each bushel. How many quarts did they expect to get from 6 bushels?

B In all, the girls got 144 quarts of canned tomatoes. They got how many fewer quarts of tomatoes than they expected to get?

C For cooking the tomatoes the girls used a kettle that held enough at one time to fill about 12 quart jars. About how many times had the girls filled the kettle by the time they had finished canning the tomatoes?

D Ann Fuller went to the store to buy 96 more jar lids. The lids were sold in packages of 8. How many packages of jar lids should Ann have bought?

E The girls canned part of the tomatoes in the morning. They canned 84 more quarts in the afternoon. How many quarts of tomatoes did they can in the morning?

F Each of the 15 girls in the 4-H Club worked 5 hours that day. How many hours of work was that in all?

G The canned tomatoes were divided equally among 3 families. How many quarts did each family get?

H Ann made a skirt for her 4-H project. She bought 2 yd. of cloth that cost $1.17 per yard. How much did she pay for the cloth?

I Ann said that it cost her $2.82 to make the skirt. How much did she spend on other things besides the cloth that she used in making the skirt?

J Ellen Case bought 3 yd. of cloth to make aprons for her 4-H project. One yard of cloth cost 54¢, another cost 65¢, and the third cost 68¢. How much did the 3 yd. of cloth cost?

K Ellen spent 84¢ for rickrack to trim her 3 aprons. She used the same amount of rickrack to trim each apron. How much did the rickrack for each apron cost?

L It cost Ellen $2.71 to make the 3 aprons. Ellen spent how much less on her project than Ann spent on hers?

M Eight of the 15 girls in the 4-H Club made skirts. The others made aprons. How many girls made aprons?

N Ellen's mother gave her $3 to buy a new sewing basket. When Ellen had paid for the basket, she had 21¢ left. How much did the basket cost?

Keeping skillful

A	$3461 + 5237 = n$	$621 - n = 400$	$8 \times 401 = n$
B	$81 + 70 + 59 = n$	$n - 605 = 434$	$7 \times 99 = n$
C	$243 + 508 + 166 = n$	$830 - 276 = n$	$23 \times 64 = n$
D	$755 + 128 + 94 = n$	$n + 389 = 715$	$75 \times 9 = n$
E	$332 + 351 + 268 = n$	$4060 + n = 6003$	$58 \times 56 = n$
F	$800 + 413 + 675 = n$	$n - 7475 = 8225$	$37 \times 440 = n$
G	$69 + 521 + 209 = n$	$n + 466 = 836$	$29 \times 185 = n$
H	$279 + 480 + 647 + 738 = n$	$59584 - n = 37701$	$420 \times 562 = n$
I	$184 + 372 + 360 + 117 = n$	$28699 - 17232 = n$	$505 \times 637 = n$

Exploring problems

see

A

Movie tickets cost 22¢ each. Sally wonders how many movie tickets she can buy with $2. Will she have any money left?

$\$2.00 \div \$.22 = n$

Number of tickets Sally can buy

You must find this number.

compute

Think of the money in pennies.

B

200 ← Think of $2.00 as 200.

Find how many groups of 22 pennies there are in 200 pennies.

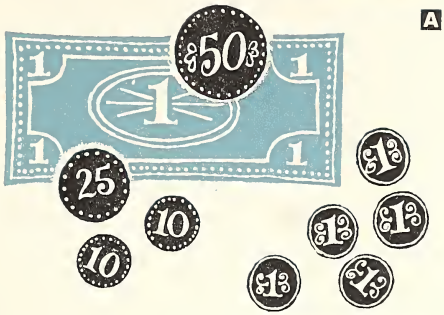
C

$$\begin{array}{r|l} 22\overline{)200} & 9 \\ \underline{198} & \\ 2 & \end{array}$$

Sally can buy 9 tickets.

She will have 2¢, or $.02, left over.

see



A

The 22 boys in the Camera Club want to buy a book. The book costs $2. If the boys share the cost equally, how much must each boy pay? Will anyone have to pay more than his share? If so, how much more will he have to pay?

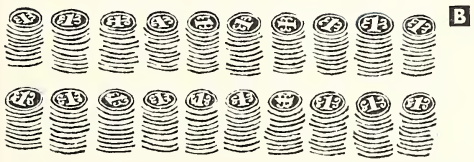
$\$2.00 \div n = 22$

Number of boys

You must find this amount of money.

compute

Think of the money they need in pennies.



B

200 ← Think of $2.00 as 200.

C

Each time the boys pay 1 penny apiece, a group of 22 pennies is used.

The pennies are now in 22 piles of 9. Each boy's share is 9¢. 2 pennies are left over.

D

$$\begin{array}{r|l} 22\overline{)200} & 9 \\ 198 & \\ \hline 2 & \end{array}$$

Each boy's share is 9¢, or $.09.

Someone must pay 2¢ more than his share.

A Patsy has $4.30 to spend for 6 presents. She wants to spend the same amount for each present. How much can she spend for each present? Will any money be left over? If so, how much?

THINK When you finish dividing, you will have two numbers. One will be the largest amount of money Patsy can spend for each present. The other will be the money left.

$4.30 \div n = 6$ Divide 430 by 6.

B Mrs. White paid $2.25 for 3 cakes of the same price. How much did each cake cost?

$2.25 \div n = 3$ Divide 225 by 3.

C The girls in the Tuesday Club have $1.50 to spend for colored paper. The paper costs $.35 a package. How many packages can they buy? Will they have any money left? If so, how much?

THINK When you finish dividing, one number will be the number of packages of paper. The remainder will be the amount of money left.

$\$1.50 \div \$.35 = n$ Divide 150 by 35.

D George bought 50¢ worth of 2-cent postcards at the post office. How many postcards did he get? Did he have any money left? If so, how much?

$\$.50 \div \$.02 = n$ Divide 50 by 2.

E How many 15-cent paper dolls can Carol buy with $.75? Will she have any money left? If so, how much?

F Twelve Cub Scouts bought a plant for their den mother. They shared the cost equally. The plant cost $3. How much was each boy's share? Did anyone have to pay more than his share? If so, how much?

G Mrs. White paid $.98 for 2 lb. of salted peanuts. The peanuts cost how much a pound?

H Tony paid $.87 for 3 goldfish. If the fish were all the same price, how much did each fish cost?

I Five boys earned $2.25 by raking leaves. They shared the money equally. How much was each boy's share? Was any money left over? If so, how much?

J Mary paid 72¢ for 1 dozen doughnuts. The doughnuts cost how many cents apiece?

K How many 15-cent candy apples can Ellen buy with $1? Will she have any money left? If so, how much?

L Don earned $2 to buy film for his camera. The film costs $.39 per roll. How many rolls of film can he buy? Will he have any money left? If so, how much?

Now you should be able to divide amounts of money.

Using arithmetic

A In science class, the fifth graders learned that a tree trunk has 1 ring for each year of the tree's age. One tree trunk had 41 rings, and another had 18 rings. The first tree was how many years older than the second tree?

B The boys and girls had planted some beans. One day they noticed that 28 bean plants had come up. The next day they saw that, in all, 46 bean plants had come up. How many had come up on the second day?

C The fifth graders wanted to plant 75 seeds of corn. They could plant 15 seeds in a box. How many boxes did they need for the 75 corn seeds?

D The fifth graders learned that the planet Mercury's year is 88 days long. Our year has 365 days. About how many of its years would Mercury have during one of our years?

THINK What do you do with the remainder in the problem? Why?

E They also learned that Jupiter has about 4380 days in its year. About how many of its years would Mercury have during one of Jupiter's years?

THINK Is the remainder large enough to add one more year to your answer?

F Suppose that Mercury had a 7-day week, just as we do. How many weeks would Mercury have in one of its years? How many days would be left over?

G If Mercury had a 30-day month, about how many months would there be in one of its years? How many days would be left over?

H John was reading a book of 170 pages about stars. He had read 93 pages. How many pages did John still have to read to finish the book?

I Patsy and Jane collected different kinds of seeds and pasted them on cardboard to show the class. Patsy had 81 different seeds. Jane had 65 different seeds. Patsy collected how many more seeds than Jane?

J The class had 24 caterpillars in a cage. One day they saw that some of the caterpillars had died. There were only 19 caterpillars left. How many of them had died?

K Twenty-four of the fifth graders belonged to a science club. In September the club collected $18 in dues for the whole year. How much did each club member pay in dues?

THINK Why do you divide 1800 by 24?

L There were 62 fifth graders in the school. How many of them were not members of the science club?

M The members of the science club planned to use $3.50 of the dues to buy magnets. Each magnet cost 85¢. How many magnets could they buy? How much money would they have left over?

N The boys and girls also bought 2 compasses. Each compass cost $2.79. How much did they pay for both of the compasses?

O At the end of the year the science club had $3.65 left of the money that had been collected in dues. How much had been spent during the year?

P The members of the science club went to a museum one day. The tickets for the 24 boys and girls cost $2.40. How much did each ticket cost?

Q Tony was putting pictures of birds in the science club scrapbook. He had 90 pictures. He could put 6 pictures on each page. How many pages did he need?

R The boys and girls in the science club are making a large picture to show what groups of stars they can find at night. They cut out some paper stars to paste on the picture. After they had used 48 stars for the picture, they still had 123 stars left. How many stars had they cut out?

Checking up

Test 1	Test 2	Test 3	Test 4
A $83 \div 2 = n$	**A** $596 \div 31 = n$	**A** $361 \div 8 = n$	**A** $\$.87 \div n = 3$
B $76 \div 4 = n$	**B** $902 \div 18 = n$	**B** $303 \div 6 = n$	**B** $\$1.24 \div \$.07 = n$
C $103 \div 3 = n$	**C** $2128 \div 56 = n$	**C** $2607 \div 79 = n$	**C** $\$.76 \div \$.02 = n$
D $426 \div 7 = n$	**D** $732 \div 25 = n$	**D** $649 \div 50 = n$	**D** $\$2.34 \div n = 9$
E $94 \div 5 = n$	**E** $584 \div 73 = n$	**E** $850 \div 9 = n$	**E** $\$4.72 \div \$.06 = n$
F $237 \div 9 = n$	**F** $1004 \div 48 = n$	**F** $705 \div 15 = n$	**F** $\$3.35 \div \$.05 = n$
G $270 \div 6 = n$	**G** $2523 \div 60 = n$	**G** $1654 \div 33 = n$	**G** $\$.72 \div n = 24$
H $500 \div 8 = n$	**H** $495 \div 80 = n$	**H** $576 \div 64 = n$	**H** $\$2.19 \div n = 30$
I $567 \div 9 = n$	**I** $612 \div 17 = n$	**I** $1600 \div 47 = n$	**I** $\$6.48 \div \$.27 = n$
J $441 \div 5 = n$	**J** $4700 \div 92 = n$	**J** $525 \div 86 = n$	**J** $\$4.80 \div \$.15 = n$
K $723 \div 8 = n$	**K** $5015 \div 64 = n$	**K** $2520 \div 28 = n$	**K** $\$3.37 \div n = 51$

Keeping skillful

A $3451 \div 9 = n$

$$9\overline{)3451}\,\Big|\,300$$
$$\underline{2700}$$

34 hundreds ÷ 9 = about ▒ hundreds. Try 300 in the answer. Then finish working the example.

B $5876 \div 28 = n$

$$28\overline{)5876}\,\Big|\,200$$
$$\underline{5600}$$

Think of 5800 instead of 5876. If you first try 100 × 28, you will subtract 2800. If you first try 200 × 28, you will subtract 5600. Using 200 × 28 will make your work shorter. Why? Can you use 300 × 28? Why or why not? Now finish working the example.

C $9860 \div 35 = n$

$$35\overline{)9860}\,\Big|\,200$$
$$\underline{7000}$$

Think of 9800. If you first try 100 × 35, you will subtract 3500. If you first try 200 × 35, you will subtract 7000. Which number will make less work for you? Can you use 300 × 35? Why or why not? Finish the work.

D $18791 \div 43 = n$

$$43\overline{)18791}\,\Big|\,400$$
$$\underline{17200}$$

Think of 18700 instead of 18791. Use as many hundreds as you can in the answer. If you try 200 × 43, you will subtract 8600. If you try 300 × 43, you will subtract ▒. Why can you use 400 × 43? Finish working the example.

A $936 \div 2 = n$
B $883 \div 4 = n$
C $602 \div 5 = n$
D $972 \div 3 = n$
E $465 \div 2 = n$
F $851 \div 7 = n$
G $5200 \div 8 = n$
H $1193 \div 4 = n$
I $4000 \div 6 = n$
J $6145 \div 7 = n$
K $8104 \div 9 = n$
L $5837 \div 8 = n$

A $8979 \div 17 = n$
B $5250 \div 46 = n$
C $8967 \div 42 = n$
D $7330 \div 19 = n$
E $6804 \div 54 = n$
F $4613 \div 23 = n$
G $10912 \div 32 = n$
H $14345 \div 25 = n$
I $10353 \div 51 = n$
J $71478 \div 88 = n$
K $61466 \div 73 = n$
L $78665 \div 95 = n$

Looking back

This lesson will help you to check up on what you know about measures.

liquid measures
2 tablespoonfuls = 1 fluid ounce
8 fluid ounces = 1 cup
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
8 pints = 1 gallon

temperature
Water freezes at 32° above 0.
Water boils at 212° above 0.

dry measures
2 dry pints = 1 dry quart
8 dry quarts = 1 peck
4 pecks = 1 bushel
32 dry quarts = 1 bushel

counting
12 things = 1 dozen

time
60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day

calendar
7 days = 1 week
52 weeks = 1 year
12 months = 1 year
365 days = 1 year

length
12 inches = 1 foot
36 inches = 1 yard
3 feet = 1 yard
5280 feet = 1 mile
1760 yards=1 mile

weight
16 ounces = 1 pound
2000 pounds = 1 ton

bushel—bu.
cup—c.
day—da.
dozen—doz.
fluid ounce—fl. oz.
foot—ft.
gallon—gal.
hour—hr.
inch—in.
mile—mi.
minute—min.
month—mo.
ounce—oz.
peck—pk.
pint—pt.
pound—lb.
quart—qt.
second—sec.
tablespoonful—tbs.
ton—T.
week—wk.
yard—yd.
year—yr.

A Would you use the table of liquid measures or the table of dry measures to find how many cups are in a quart?

B What can you think of that is sold by the pint, quart, and gallon?

C What objects do you see in your schoolroom that could be measured with a foot ruler?

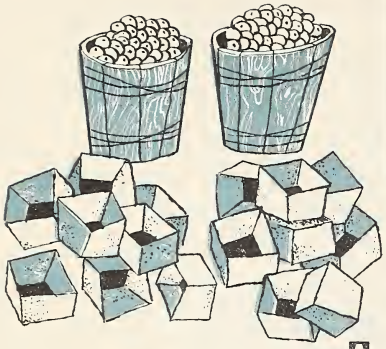
D Which table of measures would you use to find how many pecks there are in a bushel?

E What is the lowest temperature that can be measured with each of the thermometers in Picture D?

F Should a truck and a load of rocks that together weigh 6583 lb. go over a bridge that has a load limit of 4 tons?

G Which table above tells the number of things in a dozen? What things have you bought by the dozen?

H Name some foods that are bought by the pound.



A

B

A A farmer sold 2 pecks of small tomatoes. This was equal to how many dry quarts?

THINK Look at Picture A. Each peck is equal to a group of 8 quarts. 2 pecks are equal to 2 groups of 8 quarts. $2 \times 8 = n$. The 2 pecks of tomatoes were equal to ▒ quarts of tomatoes.

B Another farmer sold 8 pecks of potatoes. This was equal to how many bushels?

THINK Look at Picture B. Each group of 4 pecks is equal to 1 bushel. 8 pecks are equal to ▒ groups of 4 pecks. $8 \div 4 = n$. The 8 pecks of potatoes were equal to ▒ bushels.

C 48 weeks are equal to how many days?

THINK Each week is equal to a group of ▒ days. 48 weeks are equal to 48 groups of 7 days. $48 \times 7 = n$.

D 72 pints are equal to how many gallons?

THINK Each group of 8 pints is equal to ▒ gallon. 72 pints are equal to ▒ groups of 8 pints. $72 \div 8 = n$.

E 5 yards are equal to how many inches?

THINK Each yard is equal to a group of ▒ inches. 5 yards are equal to ▒ groups of 36 inches. $5 \times 36 = n$.

F 96 dry quarts are equal to how many bushels?

THINK Each group of 32 quarts is equal to ▒ bushel. 96 quarts are equal to ▒ groups of 32 quarts. $96 \div 32 = n$.

G 2 bushels are equal to ▒ quarts.

H 27 yards are equal to ▒ feet.

I 42 days are equal to ▒ weeks.

J 128 ounces are equal to ▒ pounds.

A 72 ft. = ▒ yd.
B 64 qt. = ▒ pk.
C 19 pt. = ▒ c.
D 180 min. = ▒ sec.
E 763 da. = ▒ wk.
F 27 doz. = ▒ things
G 42 yd. = ▒ in.
H 28 tbs. = ▒ fl. oz.
I 9 hr. = ▒ min.
J 6 T. = ▒ lb.
K 4 mi. = ▒ ft.
L 192 oz. = ▒ lb.
M 22 bu. = ▒ qt.
N 17 c. = ▒ fl. oz.
O 60 qt. = ▒ gal.

A 84 pt. = ▒ qt.
B 96 pk. = ▒ bu.
C 39 qt. = ▒ pt.
D 600 pt. = ▒ gal.
E 34 yd. = ▒ ft.
F 36 c. = ▒ pt.
G 156 in. = ▒ ft.
H 72 mo. = ▒ yr.
I 4 T. = ▒ lb.
J 14 yr. = ▒ wk.
K 120 hr. = ▒ da.
L 65 lb. = ▒ oz.
M 8 c. = ▒ fl. oz.
N 13 gal. = ▒ pt.
O 52 bu. = ▒ pk.

A 135 ft. = ▒ yd.
B 47 wk. = ▒ da.
C 58 tbs. = ▒ fl. oz.
D 1440 sec. = ▒ min.
E 40 qt. = ▒ pk.
F 24 ft. = ▒ in.
G 7 da. = ▒ hr.
H 192 qt. = ▒ bu.
I 10 mi. = ▒ ft.
J 144 things = ▒ doz.
K 32 pk. = ▒ bu.
L 420 min. = ▒ hr.
M 15 yr. = ▒ mo.
N 144 in. = ▒ yd.
O 12 c. = ▒ fl. oz.

Now you should know how to change measures to larger or smaller measures of the same kind.

Keeping skillful

A $125 \times 7 = n$
B $6 \times 429 = n$
C $8 \times 337 = n$
D $84 \times 62 = n$
E $17 \times 95 = n$
F $15 \times 130 = n$
G $413 \times 39 = n$
H $64 \times 368 = n$
I $24 \times 227 = n$
J $80 \times 801 = n$
K $184 \times 473 = n$
L $234 \times 385 = n$
M $143 \times 680 = n$

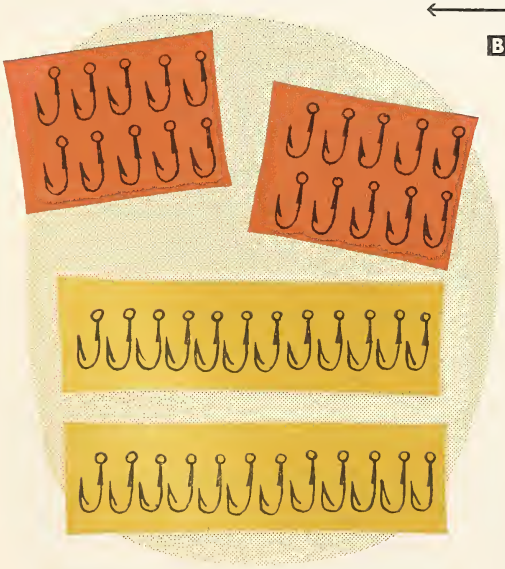
A $672 \div 4 = n$
B $396 \div 9 = n$
C $186 \div 6 = n$
D $2114 \div 3 = n$
E $7195 \div 8 = n$
F $258 \div 13 = n$
G $3729 \div 64 = n$
H $5866 \div 29 = n$
I $4001 \div 87 = n$
J $2995 \div 36 = n$
K $34210 \div 55 = n$
L $65834 \div 72 = n$
M $9060 \div 44 = n$

A $29 \times \$3.62 = n$
B $\$5.05 - \$.89 = n$
C $73¢ + 46¢ + 62¢ + 80¢ = n$
D $\$9.31 \div n = 7$
E $\$20 - \$6.43 = n$
F $56 \times \$2.89 = n$
G $132 \times \$.55 = n$
H $\$300 \div \$5 = n$
I $\$4.03 + \$2.66 + \$3.98 = n$
J $164 \times \$4.59 = n$
K $\$14.08 - \$9.77 = n$
L $\$3.22 \div \$.14 = n$
M $\$83.25 \div n = 37$

Exploring problems

see

A Tony bought 2 cards of fish hooks with 10 hooks on each card. Jim bought 2 cards of fish hooks with 12 hooks on each card. How many fish hooks did the boys buy in all?



B Think of the hooks Tony bought and the hooks Jim bought as one group.

Total number of hooks Tony bought

Total number of hooks Jim bought

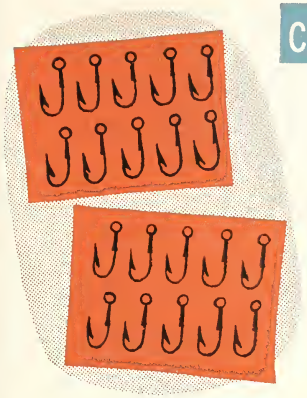
$\square + \square = n$

Number of hooks the boys bought in all

First you must find the number of hooks Tony bought and also the number of hooks Jim bought.

compute

C



Number of cards Tony bought

Number of hooks on each card

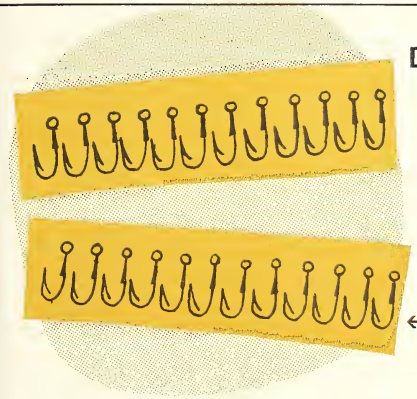
Number of hooks Tony bought in all

$2 \times 10 = \square$

You must find this number.

Think of Tony's hooks as one group.
Multiply 10 by 2. Tony bought 20 fish hooks.

D



Number of cards Jim bought

Number of hooks on each card

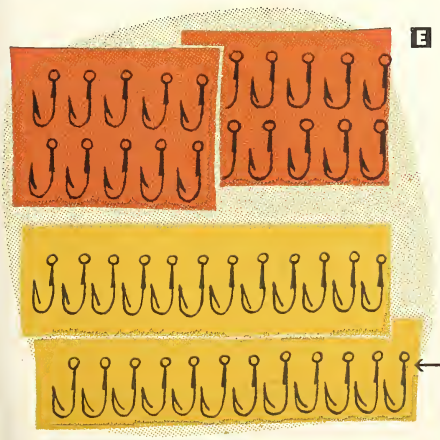
Number Jim bought in all

$2 \times 12 = \square$

You must find this number.

Think of Jim's hooks as one group.
Multiply 12 by 2. Jim bought 24 fish hooks.

E



Number of hooks Tony bought

Number of hooks Jim bought

Number they bought in all.

$20 + 24 = n$

You must find this number.

Think of the fish hooks as one group.
Add 24 to 20.
The boys bought 44 fish hooks in all.

see

A

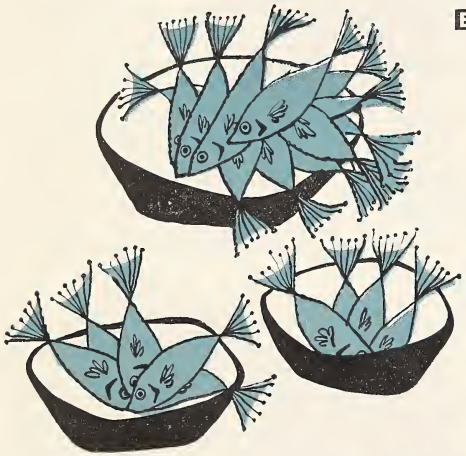
Together, Tony and Jim caught 21 fish. Tony sold 5 of the fish to his friends, and Jim sold 4 of the fish to his friends. How many fish did the boys have left then?

Number of fish the boys caught

Number of fish sold

Number they had left

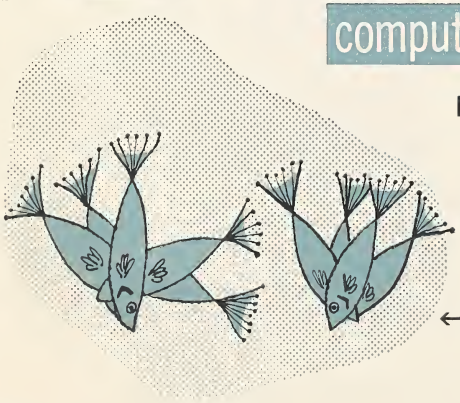
$21 - \square = n$



B

First you must find the number of fish the boys sold in all.

compute



C

Number of fish Tony sold

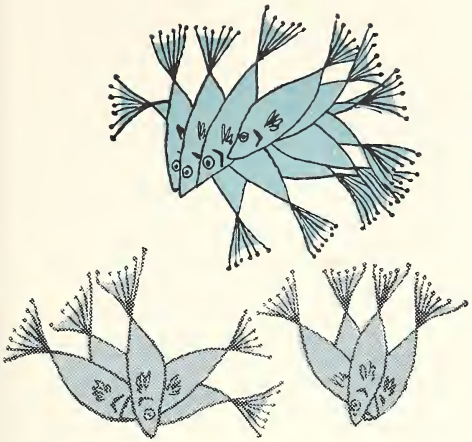
Number of fish Jim sold

Number they sold in all

$5 + 4 = \square$

You must find this number.

Think of the fish Tony and Jim sold as one group.
Add 4 to 5. The boys sold 9 fish.



D

Number of fish the boys caught

Number of fish they sold in all

Number of fish they had left

$21 - 9 = n$

You must find this number.

Imagine that the 9 fish are gone.
Subtract 9 from 21.
The boys had ▒ fish left.

A Tony fished for 35 minutes in the morning and 45 minutes in the afternoon. He did this every day for 3 days. For how many minutes in all did he fish during the 3 days?

Number of days.

Total number of minutes he fished each day.

Number of minutes he fished in all.

$3 \times \square = n$

First find the number of minutes Tony fished each day. To do this, add 45 to 35. Put 80 in the equation.
$3 \times 80 = n$
Multiply 80 by 3.
Tony fished ▒ minutes in all during the 3 days.

B Before the fishing trip Jim earned 40¢ each morning and 20¢ each afternoon for several days. He earned $4.20 in all. For how many days did he work to earn this money?

Amount Jim earned in all.

Total amount he earned each day.

Number of days he worked.

$\$4.20 \div \square = n$

First find the total amount Jim earned each day. To do this, add $.40 to $.20. Put $.60 in the equation.
$\$4.20 \div \$.60 = n$
Divide $4.20 by $.60.
Jim worked for ▒ days to earn the money.

C Jim's mother baked 3 doz. sugar cookies and 20 chocolate cookies for the fishing trip. How many cookies did she bake in all?

THINK $\square + 20 = n$

First find how many sugar cookies she baked. $3 \times 12 = \square$. What number do you put in the equation?

D One day in town Jim paid 88¢ for some dishes of ice cream with chocolate syrup. The ice cream cost 15¢ a dish. The chocolate syrup cost 7¢ a dish. How many dishes of ice cream with chocolate syrup did Jim pay for?

THINK $\$.88 \div \square = n$

First find how much each dish of ice cream with chocolate syrup cost. Add 7¢ to 15¢. Where do you put this sum?

E Tony rode his bicycle to town every day for the mail. He rode 2 mi. into town and 3 mi. coming back by a different road. In 3 days, he rode how many miles getting the mail?

$3 \times \square = n$

F Jim gathered colored stones for his collection. He gathered 10 stones one day and 16 the next day. Then he gave 9 of these stones to Tony. How many stones did he have left?

$\square - 9 = n$

G Every day at dinner each of the 4 persons who went on the fishing trip drank 2 glasses of milk. How many glasses of milk did they drink at dinner during the 3 days?

$3 \times \square = n$

H Tony mailed 6 postcards, and Jim mailed 9. Each postcard had a 2¢ stamp on it. How much did the stamps on all these cards cost?

$\square \times \$.02 = n$

I One evening Jim dug 23 worms, and Tony dug 19 worms. They used 20 of these worms the next day. How many worms did they have left?

$\square - 20 = n$

J In town one day Jim's father bought groceries for $3.66 and fishing supplies for $6.12. He gave the clerk a ten-dollar bill. How much money should the clerk have given him in change?

$\$10 - \square = n$

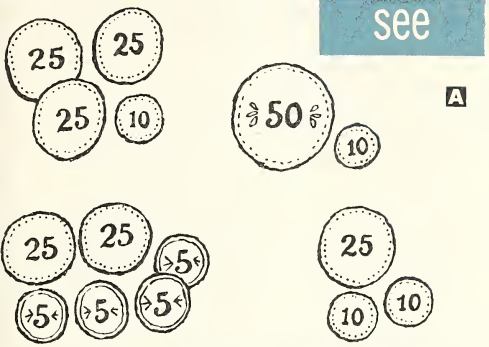
K He also made a long-distance call. He talked for 5 minutes. The first 3 minutes cost 45¢. The next 2 minutes cost 10¢ a minute. How much did it cost him to talk for 5 minutes?

$\$.45 + \square = n$

In each of these problems you had to do more than one thing to find the answer to the question in the problem.

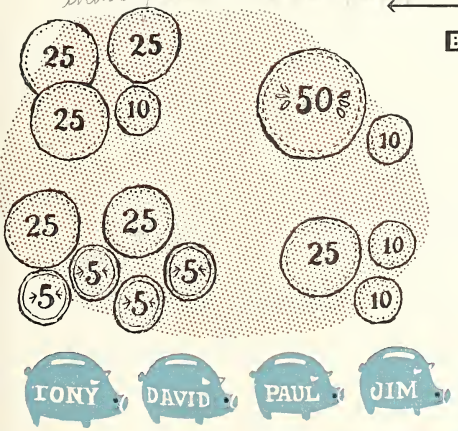
Exploring problems

see



A

Four boys started a club. To start the club, each boy loaned money he had saved. Tony loaned $.85, David loaned $.60, Paul loaned $.45, and Jim loaned $.70. Paul said, "Suppose that each of us had loaned the same amount to get that much money. How much would each of us have loaned then?"



B

Think of all the money as one amount. Then imagine that the money is to be divided into four equal parts, one for each boy.

Total amount of money

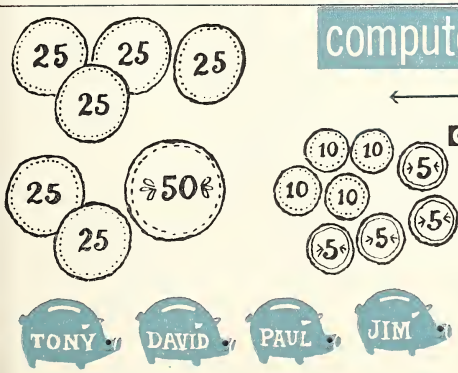
Amount in each part

$\square \div n = 4$

Number of parts

First you must find the total amount of money the boys loaned.

compute



C

Find how much money all the boys loaned.

$85¢ + 60¢ + 45¢ + 70¢ = \square$
The sum is 260¢, or $2.60.

Put $2.60 in the equation.
$\$2.60 \div n = 4$

Now turn the page.

D

Total amount loaned
Amount from each boy
Number of boys

$\$2.60 \div n = 4$

Now you must find this number.

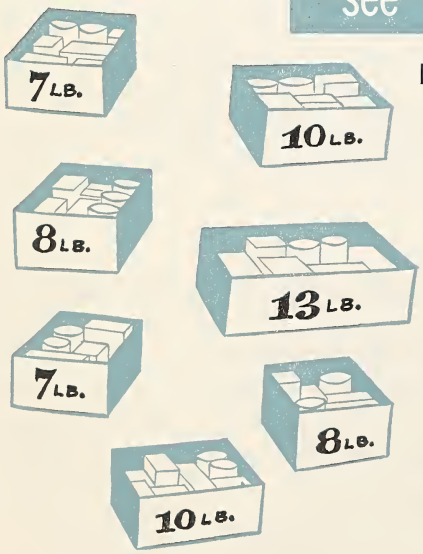
Think of the $2.60 as divided into 4 equal parts. How much will there be in each part?

Divide $2.60 by 4.
$2.60 divided by 4 equals $.65.

The amount each boy would have loaned is the average amount.
$.65 is the average.
The boys loaned an average of $.65.

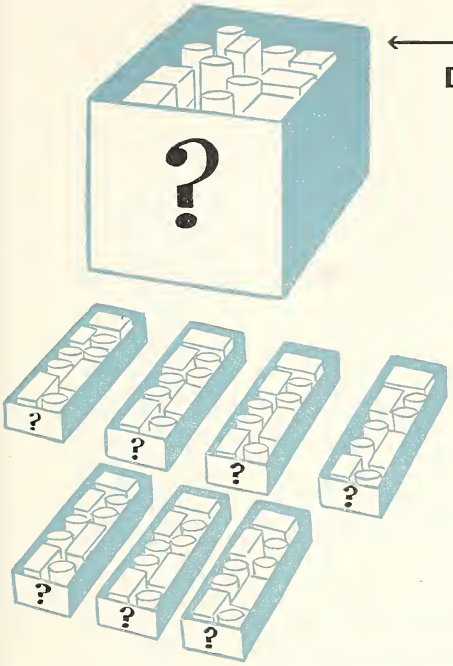
---

see



A

To earn money for the club, Paul helped to deliver groceries. The boxes of groceries that he delivered weighed 7 lb., 10 lb., 8 lb., 13 lb., 7 lb., 8 lb., and 10 lb.
What was the average weight of the boxes?



B Think of all the groceries in one big box. Then imagine that they have been divided equally among 7 boxes so that each box weighs the same.

What does this stand for?

What does this stand for?

What does this number stand for?

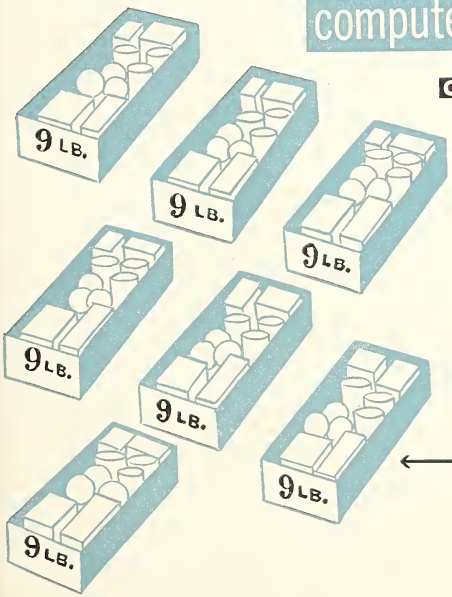
$\square \div n = 7$

First you must find this number.

---

compute

C



What do these numbers stand for?

$7 + 10 + 8 + 13 + 7 + 8 + 10 = \square$

What does this stand for?

Why is 63 put here?

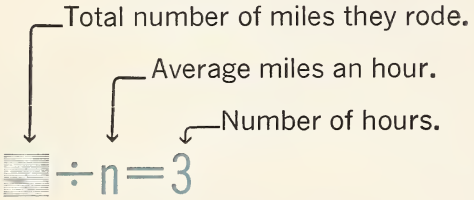
$63 \div n = 7$

Divide 63 by 7.

If each box had weighed the same, its weight would have been ▒ lb.

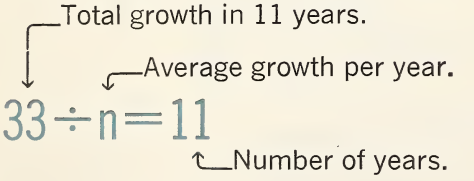
The average weight of the boxes was ▒ lb.

A One day the four boys in the club rode for 3 hours on their bicycles. They rode 8 mi. the first hour, 7 mi. the second hour, and 6 mi. the third hour. What was the average distance they rode an hour?



First find the total number of miles the boys rode. To do this, add 8, 7, and 6. Then put the sum in the equation.
21 ÷ n = 3
Now divide 21 by □.
The average distance they rode was □ mi. an hour. The average distance they rode was □ mi. per hour.

B David said, "I have grown 33 inches in 11 years." David has grown an average of how many inches a year?



Sometimes the problem tells you the total, and you do not have to find it.

C The four boys in the club went fishing one day. Each boy caught one fish. These fish were 11 in., 18 in., 14 in., and 17 in. long. What was the average length?

D These fish weighed 23 oz., 36 oz., 32 oz., and 33 oz. Find the average weight of the fish.

E David earned $1.62 for the club in 6 weeks. He earned an average of how much per week?

F The boys bought a bird book with 192 pages in it. Jim said that he was going to read it in 12 days. To do this, he would have to read an average of how many pages per day?

G In four months the boys earned $14.20 for their club. What were their average earnings per month?

H The boys worked on a clubhouse after school for 5 days. They worked 65 min. on Monday, 45 min. on Tuesday, 45 min. on Wednesday, 35 min. on Thursday, and 60 min. on Friday. They worked an average of how many minutes per day?

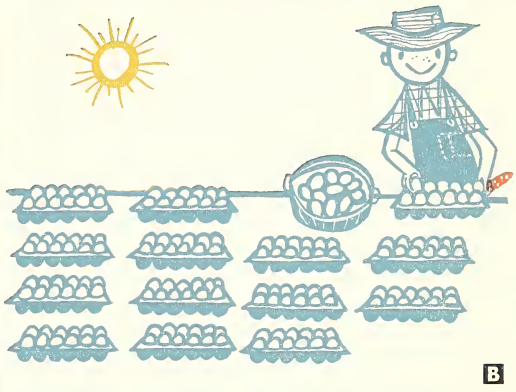
I Some old boards the boys used for their clubhouse were 60 in., 72 in., 64 in., 76 in., and 58 in. long. What was the average length?

Now you should understand how to find an average.

Thinking straight

This lesson should help you understand how to use remainders in the answers to division problems.

A



B

A In Picture A, George has 179 eggs. What would you do to find how many dozen eggs he has? Which of these statements do you think is the best to use to tell what your answer is?

1. George has 14 dozen eggs.
2. George has 15 dozen eggs.
3. George has about 14 dozen eggs.
4. George has about 15 dozen eggs.
5. George has 14 dozen eggs and 11 eggs left over.

B What do you think is the best thing to do with the remainder in Problem A?

1. Keep the remainder as part of the answer.
2. Do not use the remainder.
3. Use the remainder to make the answer larger.

C In Picture B, George is going to sell his eggs. How many cartons of 1 doz. eggs will he have for sale?

1. The answer is the same as the answer to Problem A.
2. The answer is different from the answer to Problem A.

D What happens to the remainder in Problem C?

1. The remainder is to be left unused.
2. The remainder is used in getting the answer.

E Another day George had 109 eggs. How do you find how many dozen eggs he had? What do you think is the best answer for this problem? What do you do with the remainder? How is this problem different from Problem A?

F Suppose George were to sell the eggs he had in Problem E. How many dozen eggs could he sell? Is your answer the same as the answer you gave to Problem E? What do you do with the remainder? How is this problem different from Problem C on page 105?

G The size of the remainder is important in the answers to Problems A and E, but it is not important in the answers to Problems C and F. Why?

H George, Tom, and Bill bought a baseball that cost $1.75. The boys wanted to share the cost equally. How much should each boy pay? Should each of them pay 58¢? Should each of them pay 59¢? What is wrong with each of these answers? How is the remainder important in this problem? Will one of the boys have to pay more than his share? How much more?

I There are 325 pupils at Lake School. There are 8 classrooms in the school. What is the average number of children per room? Do you think the best answer is 40 or 41 children per room? How many rooms could have 41 children? How many other rooms could have 40 children? How do the answers to these last two questions help you in deciding upon the best answer about the average number per room?

J A grocer is selling cans of orange juice at 3 cans for 46¢. If you bought 1 can of this orange juice, do you think you would have to pay 15¢ or 16¢ for it? If you think you would have to pay 16¢ for one can, why do you think the grocer sells 3 cans for 46¢ instead of for 48¢?

K Some farmers in Castletown were sending 280 sheep to market in trucks. They could put only 25 sheep in each truck. Did they need 11 or 12 trucks? How large is the remainder in this problem? Even though the remainder is small, do you think you should still use 12 trucks for your answer? Why or why not?

L Jim has a 297-page library book to read in 7 days. If he wants to read about the same number of pages per day, about how many pages should he read in one day? Could Jim read more pages on one day than another? Is an approximate answer good enough for this problem? If so, do you think the remainder is important?

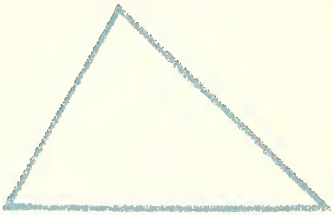
M Mr. Sands gave Kathy, Tony, and Ann $5.00 for helping him in his garden. Could the children share the money equally? How much would each child get? What do you think the children should have done with the 2 cents that would be left over?

Moving forward

In this lesson you will learn how to find the distance around rectangles, triangles, and other polygons.

A

B

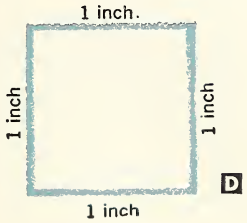


C

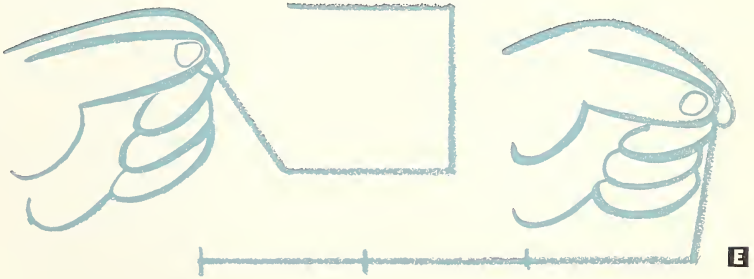
Pictures A, B, and C show polygons.
The polygon in Picture A has
4 straight sides. Its opposite sides are equal and also parallel.
It has 4 square corners, or right angles.
This polygon is a rectangle.

A A rectangle with all its sides equal is a square. Which of the three polygons above is a square?

B The polygon in Picture C has ▒ straight sides. This polygon is a triangle.



D



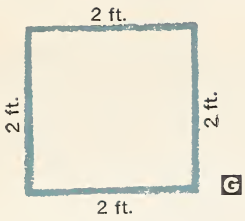
E

F

$1+1+1+1=4$ $4\times1=4$

C Pictures E and F show the distance around the square in Picture D. The distance is ▒ in.

D The distance around a polygon is the perimeter. The perimeter of the square is ▒ in.



G

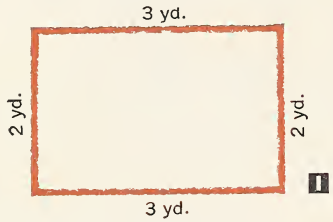
H

$2+2+2+2=n$ $4\times2=n$

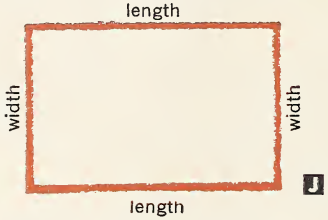
E Is the polygon in Picture G a rectangle?

F Is the polygon in Picture G a square?

G The perimeter of the square in Picture G is ▒ ft.



I



J

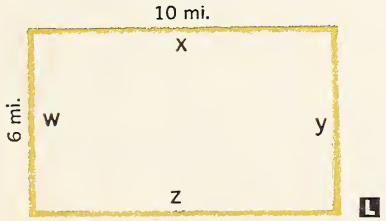
K

$2+3+2+3=n$

H Rectangles I and J are the same size. The length of each is ▒ yd.

I The width of each is ▒ yd.

J The perimeter of each is ▒ yd.



L

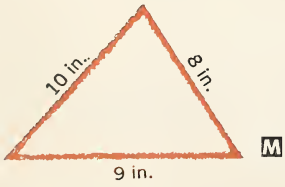
K Polygon L is a rectangle. Are the opposite sides parallel?

L Are the opposite sides equal?

M The side marked z is ▒ mi.

N The side marked y is ▒ mi.

O What numbers do you add to find the perimeter?

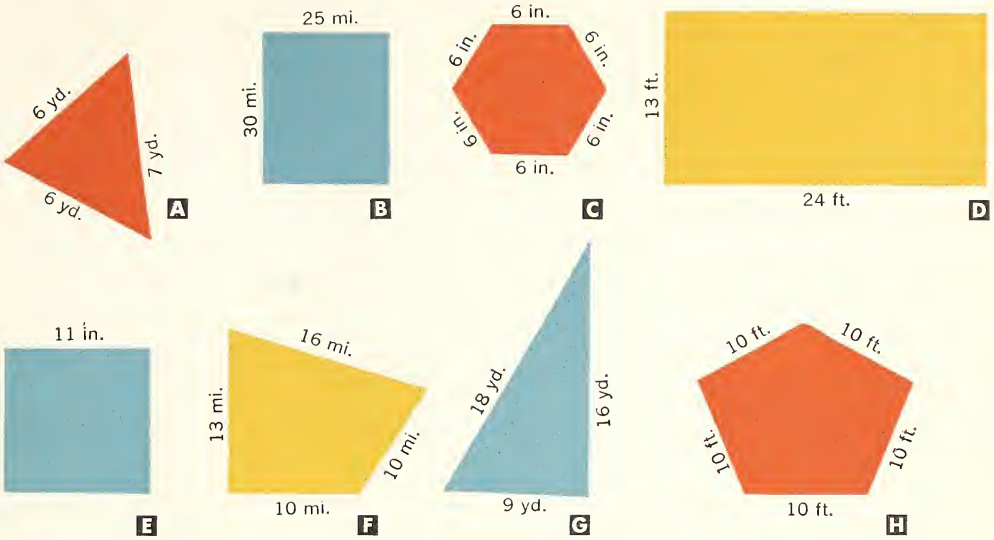


M

N

$10+9+8=n$

P The perimeter of the triangle in Picture M is ▒ in.



A Find the perimeter of each polygon shown above.

B How can you find the perimeter of any polygon?

C What are two ways to find the perimeter of a square?

D What are two ways to find the perimeter of a rectangle that is not a square?

THINK One way is to multiply the length by 2 and the width by 2. Then what do you do? What is the other way?

E A baseball diamond is a square with each side 90 ft. long. What is the perimeter of a baseball diamond?

F John read that the county in which he lives is in the shape of a rectangle 31 miles long and 23 miles wide. What is the perimeter of the county in which John lives?

G Mr. Banks wants to put a fence around a field that is in the shape of a rectangle. The field is 400 yd. long and 300 yd. wide. How many yards long will the fence be?

H Every night Tony takes his dog for a walk around the block. Tony's father says that the block is a square with each side 450 ft. long. About how far does Tony walk each night when he takes his dog around the block?

Now you should be able to find the perimeter of a polygon if you know the lengths of its sides.

Checking up

A Mr. Long has a flower shop. He has 250 bulbs to plant in bowls. He will put 3 bulbs in a bowl. How many bowls will he need? How many bulbs will be left over?

B Mrs. Fisher gave Mr. Long a 5-dollar bill to pay for a plant that cost $3.15. How much money should Mr. Long have given her in change?

C Mrs. Block bought 4 dozen daisies for 79¢ a dozen. How much did she pay for the daisies?

D Patsy Long sometimes helps her father in the flower shop. On Thursday she worked for 45 min. On Friday she worked for 40 min. On Saturday she worked for 65 min. She worked an average of how many minutes per day?

E In September there were 765 pupils at the Burns School. Then some new children came to the school. A month later the school had 790 pupils. How many pupils had been added?

F One month Carol saved 68¢. The same month Sally saved 94¢. Carol saved how much less money than Sally?

G Paul has collected 87 baseball cards and 131 football cards. How many cards in all has he collected?

H The Cub Scouts in Bill's den collected 3050 lb. of paper in a paper drive. Bob's den collected 3208 lb. Bob's den collected how many more pounds of paper than Bill's den?

I Kathy had $10 when she went to the grocery store. She bought groceries and a notebook and came home with $2.38. How much had she spent?

J Tom had some money in his pocket. His father paid him 25¢ for helping in the yard. Then Tom had $1.03 in his pocket. How much money did he have before his father paid him?

K Four girls made 64 pieces of fudge and shared the pieces equally. How many pieces did each girl get?

L Bob spent 180 minutes last week practicing on his cornet. How many hours did he spend practicing on his cornet last week?

M Jim is trying to save $2.95 to buy a radio kit. He has saved $.15 a week for the last 12 weeks. How much more money does he need for the radio kit?

N Mrs. Long baked some cookies. She gave Patsy 4 dozen cookies to take to a school party. Then she had 19 cookies left. How many cookies had she baked?

Checking up

Test 1

A $217 + 342 = n$
B $86 + 50 + 69 + 44 = n$
C $631 + 149 + 372 = n$
D $256 + 75 + 500 = n$
E $413 + 829 + 537 = n$
F $778 + 59 + 466 = n$
G $384 + 272 + 528 = n$
H $115 + 634 + 407 = n$
I $530 + 993 + 851 = n$

Test 2

A $736 - 59 = n$
B $889 - 245 = n$
C $500 - 167 = n$
D $423 - 266 = n$
E $6578 - 4391 = n$
F $2707 - 958 = n$
G $7000 - 3223 = n$
H $13645 - 8806 = n$
I $52463 - 12775 = n$

Test 3

A $4 \times 82 = n$
B $6 \times 59 = n$
C $9 \times 18 = n$
D $3 \times 255 = n$
E $7 \times 369 = n$
F $48 \times 5 = n$
G $2 \times 720 = n$
H $185 \times 8 = n$
I $9 \times 409 = n$

Test 4

A $42 \times 27 = n$
B $25 \times 39 = n$
C $17 \times 267 = n$
D $82 \times 82 = n$
E $34 \times 370 = n$
F $403 \times 58 = n$
G $66 \times 193 = n$
H $157 \times 438 = n$
I $250 \times 506 = n$

Test 5

A $81 \div 3 = n$
B $79 \div 2 = n$
C $116 \div 4 = n$
D $302 \div 6 = n$
E $293 \div 9 = n$
F $300 \div 5 = n$
G $4352 \div 7 = n$
H $7448 \div 8 = n$
I $4510 \div 6 = n$

Test 6

A $90 \div 13 = n$
B $320 \div 18 = n$
C $1058 \div 46 = n$
D $3776 \div 29 = n$
E $2249 \div 51 = n$
F $2100 \div 35 = n$
G $581 \div 72 = n$
H $34845 \div 67 = n$
I $1340 \div 19 = n$

Test 7

A $n + 420 = 600$
B $705 - n = 257$
C $n - 368 = 591$
D $873 + 449 = n$
E $652 + n = 804$
F $700 - 228 = n$
G $n - 502 = 901$
H $n + 830 = 2643$
I $968 - n = 359$

Test 8

A $124 \div n = 31$
B $7284 \div 24 = n$
C $533 \div 6 = n$
D $1596 \div n = 42$
E $747 \div n = 9$
F $221 \div 8 = n$
G $1659 \div 66 = n$
H $1008 \div n = 18$
I $6867 \div n = 7$

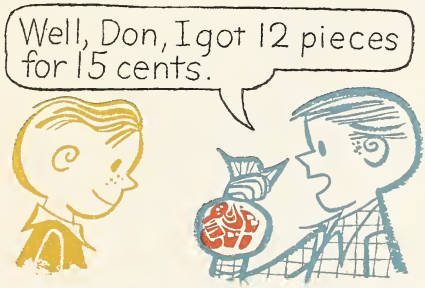
Test 9

A 16 bu. = ▒ pk.
B 4 T. = ▒ lb.
C 240 min. = ▒ hr.
D 56 fl. oz. = ▒ c.
E 9 tbs. = ▒ fl. oz.
F 6200 ft. = 1 mi. ▒ ft.
G 72 in. = ▒ ft.
H 8 lb. = ▒ oz.
I 39 ft. = ▒ yd.

Moving forward

Now you will study rate. You will learn how to use two numerals to express a rate.

A



B

When Jim answered Don's question, he told him the rate at which the candy was sold. He used two numerals to do this. The rate at which the candy was sold can be expressed in different ways.

One way to express the rate is to use the numerals 12 and 15. You can say that the candy was sold at the rate of 12 pieces for 15 cents.

Here is the way to write 12 and 15 together to express this rate.

12 shows the number of pieces that were sold. → $\frac{12}{15}$ ← 15 shows the number of cents needed.

12 per 15

A pair of numerals used in this way is called a ratio. This ratio expresses a rate. The rate is 12 per 15.

C

You can use other numerals to express the rate at which the candy was sold.

In Picture C the 12 pieces of candy and the 15 pennies are separated into 3 equal groups. The pennies in each new group will buy the pieces of candy in the group.

4 pieces and 5 pennies are in each group.

Think of only 1 of these 3 new groups.
4 pieces of candy will sell for 5 cents.

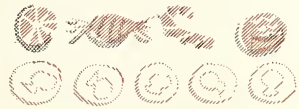
D

Now you can say that the rate is 4 pieces per 5 cents. Write the ratio this way.

4 shows the number of pieces. → $\frac{4}{5}$ ← 5 shows the number of cents needed.

4 per 5

You can now express the rate as 4 per 5.



You can use two other numerals to express the rate. Think of 2 of the 3 new groups.
8 pieces of candy will sell for 10 cents.

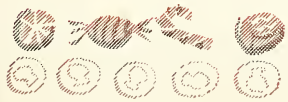
E

Now you can say that the rate is 8 pieces per 10 cents. Write the ratio this way.

8 shows the number of pieces. → $\frac{8}{10}$ ← 10 shows the number of cents needed.

8 per 10

Now the rate is expressed as 8 per 10.



F

Picture F shows what happens when more than 12 pieces of candy are sold at the rate Jim paid. It shows that for 20 pieces, 25 cents would be needed. This time you can express the rate as 20 per 25.

What does the 20 show? → $\frac{20}{25}$ ← What does the 25 show?

20 per 25

A Does 16 per 20 also express the rate shown in Picture F?

B Now you see that 4 per 5, 8 per 10, 12 per 15, 16 per 20, and 20 per 25 all express the same rate.

$$\frac{4}{5} = \frac{\square}{10} = \frac{\square}{15} = \frac{\square}{20} = \frac{\square}{25}$$

When you expressed the rate as 20 pieces for 25 cents, you thought of the number of pieces first. Look at Picture F again. Now think of the amount of money first. When you think this way, you can express the rate as 25 cents for 20 pieces. Write the rate as a ratio this way.

25 shows the number of cents. → $\frac{25}{20}$ ← 20 shows the number of pieces.

25 per 20

C Now look at 1 group in Picture F. Think of the money first. You can express the rate as 5 cents for ▒ pieces. Write the rate as a ratio this way.

What does the 5 show? → $\frac{5}{4}$ ← What does the 4 show?

5 per 4

D If you express the rate as 15 per 12, are you thinking first of the money or of the candy?

E 5 per 4, 10 per 8, 15 per 12, 20 per 16, and 25 per 20 all express the same rate.

$$\frac{5}{4} = \frac{\square}{8} = \frac{\square}{12} = \frac{\square}{16} = \frac{\square}{20}$$

G Don also expressed a rate when he told Jim how much his candy cost. This rate, too, can be expressed in different ways.

H You can say that Don's candy was sold at the rate of 12 pieces for 10 cents.

To show the rate, you can write the numerals 12 and 10 as a ratio.

12 shows the number of pieces. → $\frac{12}{10}$ ← 10 shows the number of cents.

$\frac{\square}{\square}$ per 10

You can express the rate as ▭ per ▭.

I You can use other numerals to express the rate at which Don's candy was sold.

The 12 pieces of candy and the 10 pennies are now separated into 2 equal groups. The pennies in each new group will buy the pieces of candy in the group.

There are ▭ pieces of candy and ▭ pennies in each new group.

Now turn the page.

J

Think of only 1 of these 2 new groups.
6 pieces of candy will sell for ▒ cents.

You can say that the candy sold at a rate of ▒ pieces for ▒ cents. You can write the ratio that shows the rate this way.

What does the 6 show? → $\frac{6}{5}$ ← What does the 5 show?

▒ per 5

Now the rate is expressed as 6 per ▒.

K

Picture K shows what happens when more than 12 pieces are sold at the rate Don paid. It shows that for 24 pieces, 20 cents would be needed.

You can express the rate now as 24 per 20.

What does the 24 show? → $\frac{24}{20}$ ← What does the 20 show?

▒ per ▒

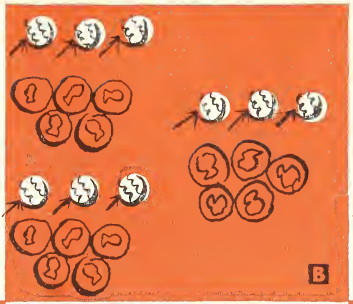
The rate is expressed now as ▒ per ▒.

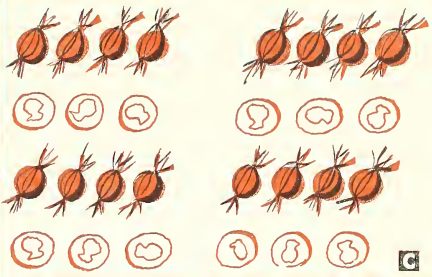
Does 18 per 15 also express the rate shown in Picture K?

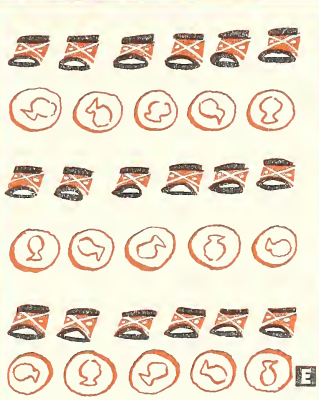
Do you see that 12 per 10, 6 per 5, and 18 per 15 all express the same rate?

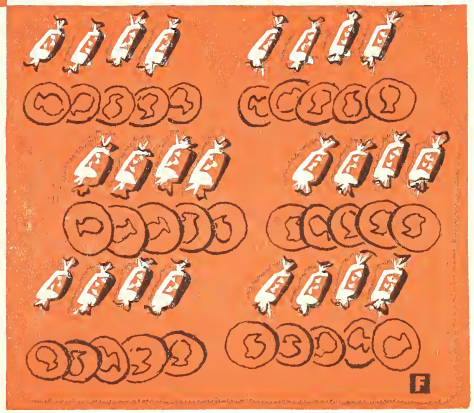
$$\frac{12}{10} = \frac{6}{5} = \frac{18}{15}$$

You can also express the rate at which Don's candy was sold as 5 per 6. What do the 5 and 6 mean?









Each ratio below expresses a rate. For each ratio there is a picture. Find the picture that shows each rate.

A	$\frac{9}{6}$	F	$\frac{3}{2}$	K	$\frac{6}{15}$	P	$\frac{6}{5}$
B	$\frac{12}{10}$	G	$\frac{18}{15}$	L	$\frac{15}{12}$	Q	$\frac{6}{9}$
C	$\frac{4}{10}$	H	$\frac{3}{5}$	M	$\frac{6}{10}$	R	$\frac{4}{5}$
D	$\frac{4}{3}$	I	$\frac{8}{20}$	N	$\frac{12}{9}$	S	$\frac{8}{6}$
E	$\frac{16}{12}$	J	$\frac{2}{3}$	O	$\frac{20}{16}$	T	$\frac{9}{15}$

For each statement below, write the numerals as a ratio to show the rate.

- A 10 apples for 18¢
- B 12 cookies for 40¢
- C 5 candy bars for 16¢
- D 5¢ for 6 pieces of candy
- E 5 lemons for 27¢
- F 6 yards of ribbon for 39¢
- G 10¢ for 12 sheets of paper
- H 12 lollipops for 29¢
- I 50 marbles for 19¢
- J 10 flower bulbs for 55¢
- K 6 cans of fruit drink for 59¢

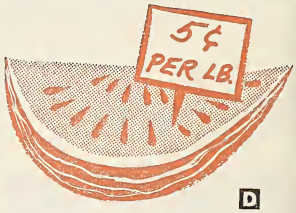
Now you know how numerals are used to express rates. Later on you will use rates to solve problems.

Thinking straight

A

B

C



D

A Sign A shows a speed of ▒ mi. in 1 hr. This rate is usually thought of as 30 miles per hour. The rate is written as a ratio this way.

What does the 30 stand for? → $\frac{30}{1}$ ← What does the 1 stand for?

You do not usually think of the rate as 1 hour per 30 miles.

B Sign B shows a speed of ▒ mi. in 1 hr. Is this rate usually thought of as 45 mi. per hour or as 1 hour per 45 miles? Write this rate as a ratio.

C One way to express the cost shown in Picture C is 2 ~~~ per 33 ~~~. Can you also express this rate as 33¢ per 2 cans? Does the way you express the rate make any difference?

D One way to express the cost shown in Picture D is 5 ~~~ per 1 ~~~. Can you also express this rate as 1 lb. per 5¢? Is one way of expressing the rate better than the other? Why?

E Bob's father drove 65 mi. in 2 hr. Would you usually express this rate as 2 hr. per 65 mi. or as 65 mi. per 2 hr.? Which ratio at the right expresses the usual way you think of this rate? $\frac{2}{65}$ $\frac{65}{2}$

F Paul earned $6 in 5 da. Would his rate of earning usually be expressed as $6 per 5 da. or as 5 da. per $6? Write this rate as a ratio.

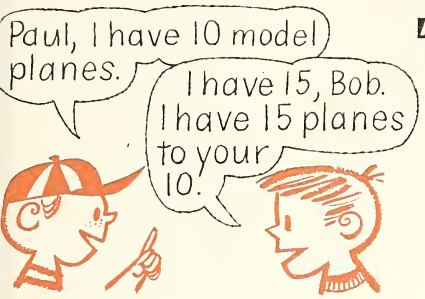
G Tony worked 8 hr. in 3 da. How would this rate usually be expressed? How would it be written as a ratio?

Write a ratio for each rate below.

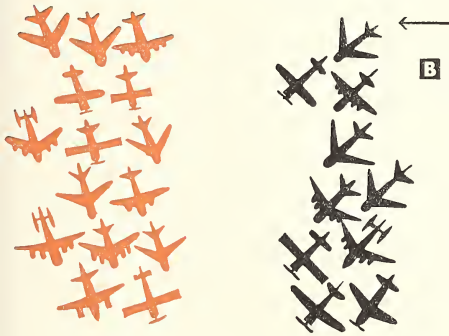
A 45 mi. in 3 hr.
B 87¢ for 3 lb.
C 56¢ for a dozen
D 1 tbs. per 2 lb.
E 8¢ each
F 2 for 19¢
G 49¢ a pound
H 10 lb. for 63¢
I 29¢ for 11 oz.
J $3 per box

Moving forward

Now you will learn how to use a ratio to compare one group with another.



A Paul compared his planes with Bob's by using two numerals, 15 and 10.

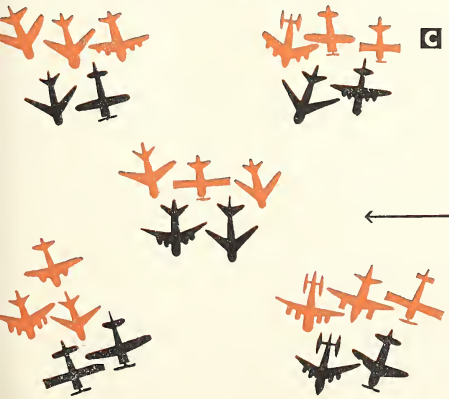


This picture shows both boys' planes.

B You can express the comparison that Paul made by writing the numerals 15 and 10 as a ratio. Your ratio will look like this.

Number of Paul's planes that are compared with Bob's planes → $\frac{15}{10}$ ← Number of Bob's planes that Paul's planes are compared with

15 to 10



C You can use other numerals to compare Paul's planes with Bob's.

Now Paul's 15 planes and Bob's 10 planes are separated into 5 equal groups. 3 of Paul's planes and 2 of Bob's are in each group.

Now turn the page.

D

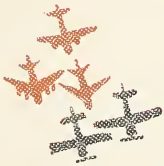
Think of one of these groups. Now you can compare Paul's planes with Bob's by saying that there are 3 of Paul's planes to 2 of Bob's.

The ratio that shows this comparison is written this way.

Number of Paul's planes that you are thinking about now → 3

Number of Bob's planes that Paul's planes are compared with ← 2

3 to 2



You can now express the comparison of Paul's planes to Bob's as 3 to 2.

E

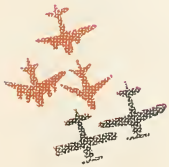
When you think of three of the groups, you can use other numerals to express the comparison of Paul's planes to Bob's.

Now you can express the ratio as 9 planes to 6 planes. Write the ratio this way.

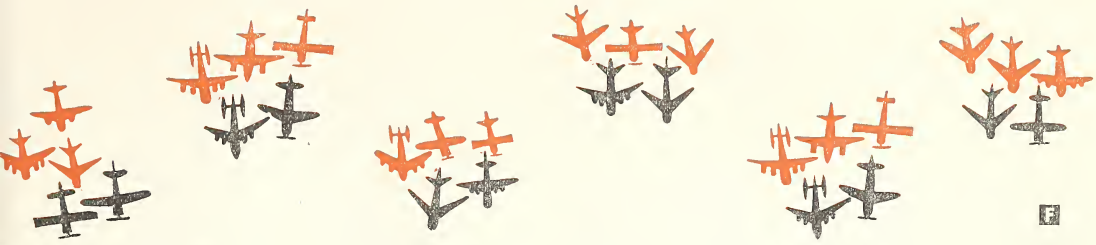
Number of Paul's planes you are thinking about → 9

Number of Bob's planes that Paul's planes are compared with ← 6

9 to 6



The comparison of Paul's planes to Bob's is now expressed as 9 to 6.



F

Picture F shows that the boys bought some more planes. Now there are 18 of Paul's planes to 12 of Bob's. Write the comparison as a ratio this way.

What does the 18 show? → $\frac{18}{12}$ ← What does the 12 show?

18 to 12

A Does 6 to 4 also express the comparison of Paul's planes with Bob's? What part of Picture F shows this?

B Does 12 to 8 also express the comparison of Paul's planes with Bob's?

C 3 to 2, 6 to 4, 9 to 6, 12 to 8, 15 to 10, and 18 to 12 all express the same comparison.

$\frac{3}{2} = \frac{\blacksquare}{4} = \frac{\blacksquare}{6} = \frac{\blacksquare}{8} = \frac{\blacksquare}{10} = \frac{\blacksquare}{12}$

When you expressed the comparison as 18 planes to 12 planes, you compared Paul's 18 planes with Bob's 12 planes. Now look at Picture F again. This time compare Bob's 12 planes with Paul's 18 planes.

Number of Bob's planes you are thinking about → $\frac{12}{18}$ ← Number of Paul's planes that Bob's planes are compared with

12 to 18

Look at 1 group in Picture F and compare Bob's planes with Paul's. You can express the comparison now as 2 planes to 3 planes. Write the comparison as a ratio this way.

What does the 2 show? → $\frac{2}{3}$ ← What does the 3 show?

2 to 3

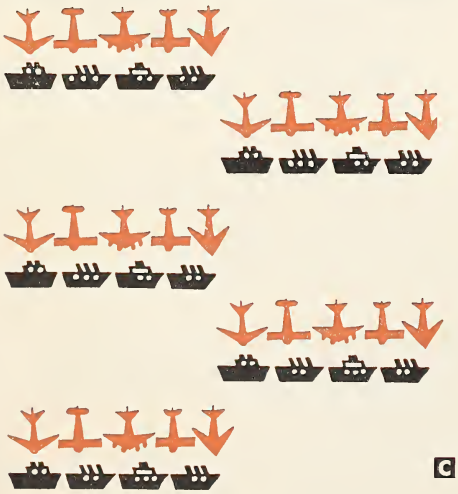
D If you express the comparison as 8 to 12, are you comparing Bob's planes with Paul's or Paul's planes with Bob's?

E 2 to 3, 4 to 6, 6 to 9, 8 to 12, 10 to 15, and 12 to 18 all express the same comparison.

$\frac{2}{3} = \frac{\blacksquare}{6} = \frac{\blacksquare}{9} = \frac{\blacksquare}{12} = \frac{\blacksquare}{15} = \frac{\blacksquare}{18}$

A

B



C

A Look at Picture A. There are ▭ sailboats. There are ▭ motorboats. Finish the ratio at the right to compare all the sailboats with all the motorboats.

B Think of one group of sailboats and motorboats. There are ▭ sailboats and ▭ motorboats. Write the ratio to compare sailboats with motorboats. Write the ratio to compare motorboats with sailboats.

C Think of three groups of sailboats and motorboats. There are ▭ sailboats and ▭ motorboats. Write the ratio to compare sailboats with motorboats. Write the ratio to compare motorboats with sailboats.

D Use three other pairs of numerals to compare the sailboats with the motorboats.

E Use three other pairs of numerals to compare the motorboats with the sailboats.

F For Picture B write the ratio to compare all the cars with all the engines.

G Use two other pairs of numerals to compare the cars with the engines.

H Which pairs of numerals below show the comparison of planes with steamboats in Picture C?

$\frac{10}{8}$ $\frac{3}{4}$ $\frac{1}{2}$ $\frac{15}{12}$ $\frac{5}{4}$ $\frac{2}{3}$ $\frac{20}{16}$ $\frac{25}{20}$

I Which pairs of numerals below show the comparison of steamboats with planes?

$\frac{3}{4}$ $\frac{20}{25}$ $\frac{5}{6}$ $\frac{8}{10}$ $\frac{8}{5}$ $\frac{4}{5}$ $\frac{12}{15}$ $\frac{16}{20}$

Each ratio below expresses a comparison. Find a picture that belongs with each ratio. For example, Ratio A can be used to compare 6 of the new engines with 15 of the old engines in Picture D.

A $\frac{6}{15}$	E $\frac{5}{6}$	I $\frac{16}{20}$	M $\frac{12}{32}$
B $\frac{3}{7}$	F $\frac{9}{24}$	J $\frac{14}{6}$	N $\frac{12}{15}$
C $\frac{12}{10}$	G $\frac{7}{8}$	K $\frac{8}{3}$	O $\frac{15}{18}$
D $\frac{21}{24}$	H $\frac{10}{4}$	L $\frac{2}{5}$	P $\frac{5}{4}$

For each comparison given below, use the numerals to write a ratio.

- A 10 model cars with 4 model cars
- B 4 model cars with 10 model cars
- C 27 stamps with 18 stamps
- D 4 dolls with 1 doll
- E 9 pictures with 12 pictures
- F 6 books with 10 books
- G 18 plants with 12 plants
- H 12 pencils with 8 pencils
- I 8 pencils with 12 pencils
- J 24 records with 15 records
- K 10 cents with 14 cents
- L 20 erasers with 16 erasers

Now you should be able to write a ratio to compare one group with another.

Using arithmetic

A Paul and George raised 13 pigs for a 4-H Club project. They gave each pig 6 lb. of feed each day. How many pounds of feed did they use in one day?

B In a month the boys fed the pigs about 780 lb. of shelled corn. One bushel of shelled corn weighs 56 lb. About how many bushels of shelled corn did they feed the pigs that month?

THINK Which is the better answer, about 13 bu. or about 14 bu.? Why?

C The boys grew the corn they used for feeding the pigs. The corn that they harvested gave them about 75 bu. of shelled corn. About how many pounds of shelled corn did they get?

D When the boys took their pigs to be sold, they learned that the 13 pigs weighed 2990 pounds. What was the average weight of the pigs?

E Sally canned 64 pt. of applesauce and 95 qt. of tomatoes for a 4-H project. She canned how many quarts of applesauce and tomatoes in all?

THINK 64 pt. = ▒ qt. What should you do next?

F Sally canned how many more quarts of tomatoes than quarts of applesauce?

G Sally's mother said that she would use about 2 qt. of applesauce per week. The applesauce that Sally had canned would last about how many weeks?

H Sally and Mary baked 16 loaves of bread for the 4-H Club fair. 9 of the loaves were white bread, and the others were raisin bread. They baked how many loaves of raisin bread?

I As a 4-H project, Jim and Kathy planned a family budget for a year. They figured that their family would spend an average of $95 per month for food. How much did they think their family would spend for food in one year?

J Jim and Kathy allowed $500 for clothing for the year. They allowed an average of about how much per month for clothing?

THINK Which is the better answer, $41 or $42? Why?

K The family's average income per month is $325. About how much money will be left each month after they have paid for food and clothing?

THINK Which problem tells you about how much they will spend per month for food? How do you know about how much they will spend for clothing?

L Jim and Kathy think their family will spend about how much less in one year for clothing than for food?

M In the spring Jim had 120 tomato plants to set out. He set out some of the plants one morning. At noon he still had 45 plants to set out. How many plants did he set out in the morning?

N Jim planted the 120 tomato plants in rows of 15 plants each. How many rows did he set out?

O Jim hoped that his tomatoes would be ready to eat in about 8 weeks. He hoped that they would be ready in about how many days?

P One day he said that his tomatoes should be ready in about 2 wk. About how many days had it been since Jim had planted the tomatoes?

Q Kathy took care of 30 chickens for her 4-H project. Her chickens laid 21 eggs one day, 17 eggs the second day, 23 eggs the third day, 18 eggs the fourth day, and 16 eggs the fifth day. They laid an average of how many eggs per day?

R Use this average to find about how many eggs Kathy's chickens would lay in one month of 30 days.

S One month the family used 11 doz. of the eggs that Kathy's chickens had laid. Kathy still had 34 doz. eggs left to sell. How many dozen eggs had her chickens laid that month?

Keeping skillful

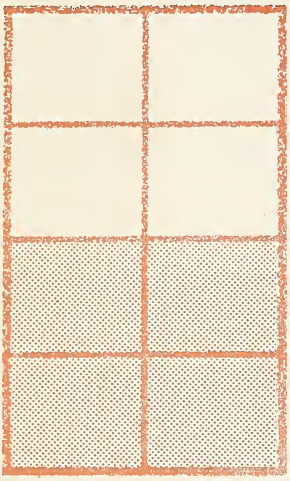
A 16 fl. oz. = ▭ tbs.
B 108 in. = ▭ ft.
C 32 dry pt. = ▭ pk.
D 5 gal. = ▭ pt.
E 208 wk. = ▭ yr.
F 4 hr. = ▭ min.
G 96 oz. = ▭ lb.
H ▭ pk. = 4 bu.
I 4 c. = ▭ fl. oz.
J ▭ da. = 72 hr.
K 8 T. = ▭ lb.
L 64 dry qt. = ▭ bu.

M ▭ sec. = 3 min.
N 56 da. = ▭ wk.
O 108 ft. = ▭ yd.
P 5 yr. = ▭ mo.
Q ▭ pt. = 4 c.
R 40 dry qt. = ▭ pk.
S 5 yd. = ▭ in.
T 4 yr. = ▭ da.
U ▭ mi. = 5280 ft.
V 5 c. = ▭ fl. oz.
W 8 lb. = ▭ oz.
X ▭ hr. = 7 da.

A $n + 628 = 1115$
B $6208 \div n = 97$
C $8000 - 129 = n$
D $76 \times 403 = n$
E $n - 624 = 1002$
F $604 \div 19 = n$
G $143 + 69 + 107 = n$
H $536 + n = 724$
I $1316 \div n = 28$
J $n + 21030 = 41762$
K $249 \times 836 = n$
L $20100 - n = 4215$

Moving forward

Now you will learn how pairs of numerals are used to express fractions.



A

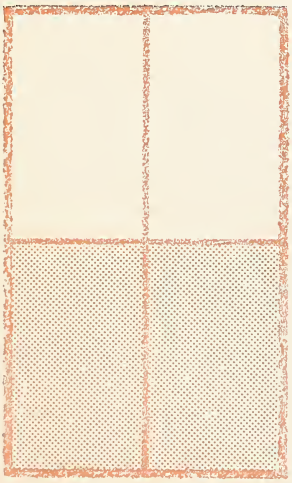
The piece of paper in Picture A is marked off in 8 equal parts. 4 of these parts are red.

You can use the numerals 4 and 8 to tell what part of the paper is red. Write the numerals this way.

The 8 shows the number of equal parts. → $\frac{4}{8}$ ← The 4 shows you are thinking of 4 of the equal parts.

four eighths

$\frac{4}{8}$ is a fraction numeral. 8 is the denominator. 4 is the numerator.



B

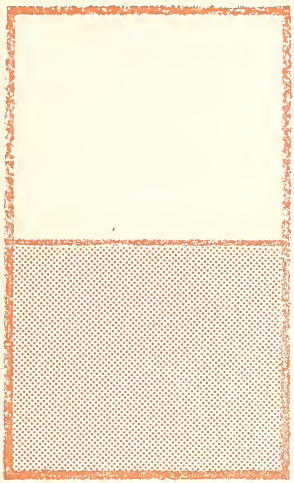
Now look at Picture B. The same part is red. This time think of the piece of paper as marked off in 4 equal parts. 2 of these parts are red.

Now you can use the numerals 2 and 4 to write a fraction numeral that tells what part is red. Write the numerals this way.

The 4 shows the number of equal parts. → $\frac{2}{4}$ ← The 2 shows you are thinking of 2 of the equal parts.

two fourths

In the fraction numeral $\frac{2}{4}$, 4 is the denominator. 2 is the numerator.



C

There are other fraction numerals you can use to tell that the same part of the paper is red. Look at Picture C. This time think of the piece of paper as marked off in 2 equal parts. 1 of these parts is red.

This time you can use the pair of numerals 1 and 2 to tell what part is red.

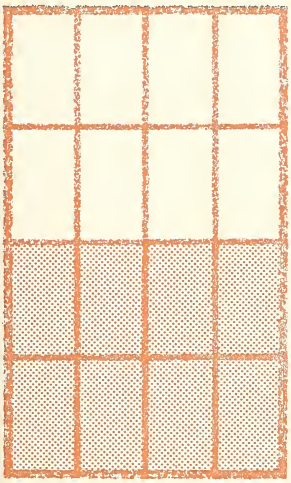
The 2 shows the number of equal parts.

$$\frac{1}{2}$$

The 1 shows you are thinking of 1 of the equal parts.

one half

2 is the denominator of this fraction numeral.
1 is the numerator.



D

Picture D shows how to get still another fraction numeral that tells what part is red. Think of the piece of paper as marked off in 16 equal parts. 8 of these parts are red.

Now you can use the numerals 8 and 16 to tell what part is red.

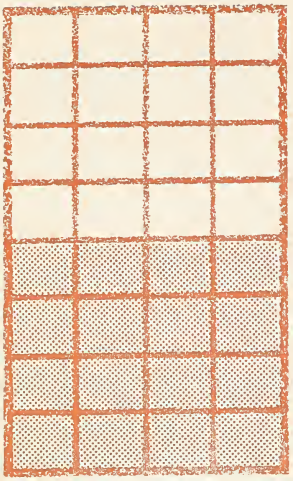
The 16 shows the number of equal parts.

$$\frac{8}{16}$$

The 8 shows you are thinking of 8 of the equal parts.

eight sixteenths

16 is the denominator of this fraction numeral.
8 is the numerator.



E

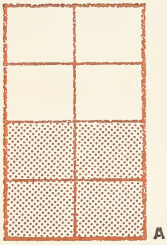
Picture E shows the same paper with the same part red. Think of the paper as marked off in 32 equal parts. ▒ of these parts are red.

To tell what part of the paper is red, you can use the numerals 16 and 32.

What does the 32 show? → $\frac{16}{32}$ ← What does the 16 show?

sixteen thirty-seconds

What is the denominator of this fraction numeral? What is the numerator?

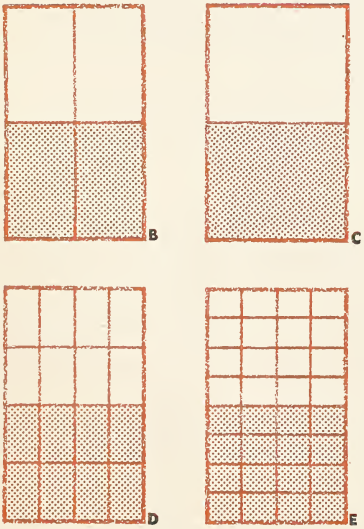


F

Here are the five pictures you have been working with. In each picture the same part of the paper is red. The same fraction of the paper is red.

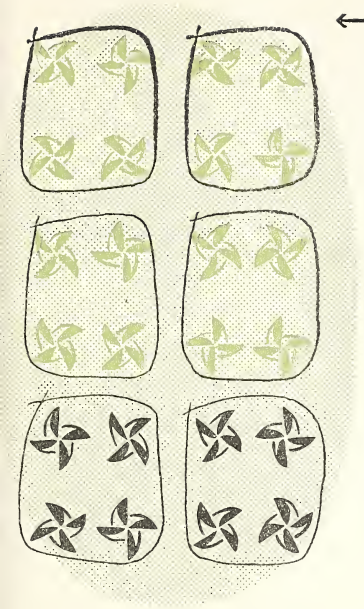
The fraction numeral $\frac{4}{8}$ tells what fraction of Picture A is red. What fraction numeral tells what fraction of Picture B is red?

For each of the other three pictures, write the fraction numeral that tells what fraction is red.



You can use several different fraction numerals to tell what fraction of the paper is red. You can use $\frac{4}{8}$, $\frac{2}{4}$, $\frac{1}{2}$, $\frac{8}{16}$, or $\frac{16}{32}$.

$\frac{4}{8} = \frac{2}{4} = \frac{1}{2} = \frac{8}{16} = \frac{16}{32}$



G

You can also use different fraction numerals to express a fractional part of a group. Look at Picture G. First think of the pinwheels as one big group. The rings show that you are to think of the pinwheels as separated into 6 equal groups. 4 of these equal groups are green.

You can tell what fraction of the pinwheels is green by writing a fraction numeral. Use the numerals 4 and 6.

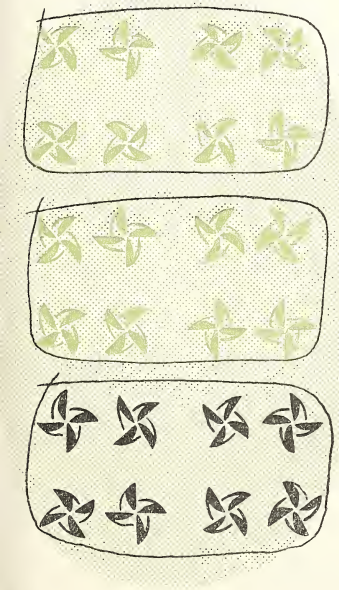
The 6 shows the number of equal groups.

$\frac{4}{6}$

The 4 shows you are thinking of 4 of the equal groups.

four sixths

6 is the denominator of the fraction numeral $\frac{4}{6}$.
4 is the numerator.



H

Picture H shows the same pinwheels. Now think of them as separated into 3 equal groups. 2 of the equal groups are green.

Use the numerals 2 and 3 to tell what fraction of the pinwheels is green.

The 3 shows the number of equal groups.

$\frac{2}{3}$

The 2 shows you are thinking of 2 of the equal groups.

two thirds

▒ is the denominator of this fraction numeral.
▒ is the numerator.

Now turn the page.

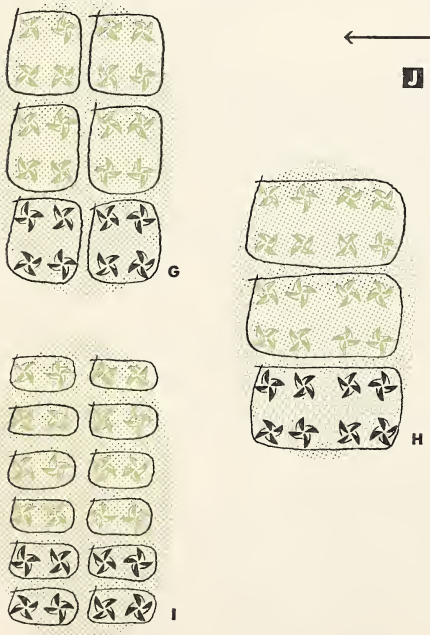
I

Picture I shows how to get another fraction numeral that tells what fraction of the pinwheels is green. Now think of the pinwheels as separated into 12 equal groups. ▒ of the equal groups are green.

The 12 shows that the pinwheels are separated into ▒ equal groups. → $\frac{8}{12}$ ← The 8 shows you are thinking of ▒ of the equal groups.

eight twelfths

▒ is the denominator of this fraction numeral.
▒ is the numerator.



J

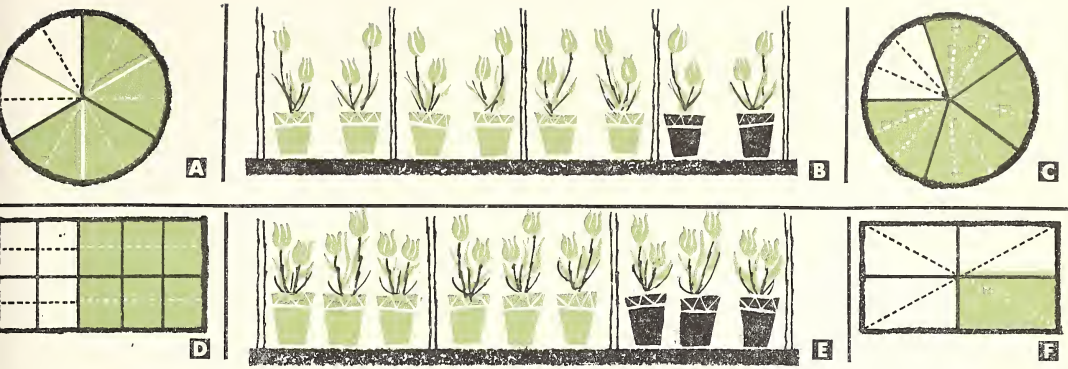
Here are the three pictures of pinwheels you have been working with. In each picture the same fraction of the pinwheels is green.

The fraction numeral $\frac{4}{6}$ tells what part of the pinwheels in Picture G is green. What fraction numeral tells what part in Picture H is green?

What fraction numeral tells what part of the pinwheels in Picture I is green?

You can use several different fraction numerals to tell what fraction of the pinwheels is green. You can use $\frac{▒}{▒}$, $\frac{▒}{▒}$, or $\frac{▒}{▒}$.

$\frac{4}{6} = \frac{2}{3} = \frac{8}{12}$



A The paper in Picture A has been divided to show thirds, sixths, and twelfths. Write three fraction numerals that tell what fraction of the paper is green.

B The plants in Picture B are arranged to show fourths and eighths. Write two fraction numerals that tell what fraction of the plants are in green pots.

C Picture C shows fifths and ~~~. Write two fraction numerals that tell what fraction of the piece of paper is green.

D Picture D shows fifths, ~~~, and ~~~. Write three fraction numerals that tell what fraction of the piece of paper is green.

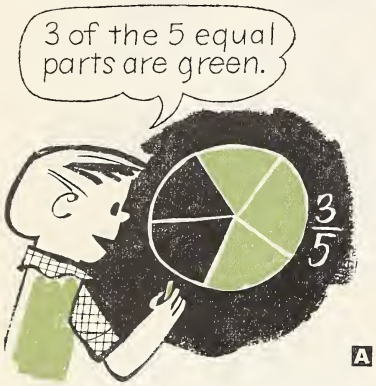
E The plants in Picture E are arranged so that you can see thirds and ~~~. Write two fraction numerals that tell what fraction of the plants are in green pots.

F Picture F shows ~~~ and ~~~. Write two fraction numerals that tell what fraction of the paper is green.

G For each picture below, write as many fraction numerals as you can that tell what fraction of the piece of paper is green. For Picture G you can write $\frac{1}{5}$ and $\frac{\square}{10}$.

Now you should be able to read and write fraction numerals and should understand what they mean.

Thinking straight



A

B

C

Look at each of the three pictures at the left. Notice that, in each picture, 3 is written over 5 as one numeral. You cannot tell what this numeral stands for in each picture until you understand the picture.

If the numeral is a fraction numeral, you read it "three fifths." If it is a ratio that expresses a rate, you read it "three per five." If it is a ratio that expresses a comparison, you read it "three to five." Until you know what the numeral stands for, you can read it "three over five."

A Look at Picture A again. What does the 5 stand for? What does the 3 stand for? Did John write a fraction numeral or a ratio? How do you read the numeral John wrote?

B Now look at Picture B. What does the 3 stand for? What does the 5 stand for? Did Susan write a fraction numeral or a ratio? How do you read the numeral Susan wrote?

C Look at Picture C. What does the 3 stand for? What does the 5 stand for? Did Bill write a fraction numeral or a ratio? How do you read the numeral Bill wrote?

D Ann earned $6, and Susan earned $5. In the numeral at the right, what does the 6 stand for? What does the 5 stand for? Does the numeral express a rate, a comparison, or a fraction? Read the numeral.

$\frac{6}{5}$

E Mr. Brown drove 98 mi. in 3 hr. In the numeral at the right, what does the 98 stand for? What does the 3 stand for? Does the numeral express a comparison, a rate, or a fraction? Read the numeral.

$$\frac{98}{3}$$

F Mrs. Brown cut a cake into 12 equal pieces. She used 7 pieces for supper. In the numeral at the right, what does the 12 stand for? What does the 7 stand for? Does the numeral express a rate, a comparison, or a fraction? Read the numeral.

$$\frac{7}{12}$$

G A grocer sold 2 cans of beans for 33¢. In the numeral at the right, what does the 2 stand for? What does the 33 stand for? Does the numeral express a rate, a fraction, or a comparison? Read the numeral.

$$\frac{33}{2}$$

For each of the following exercises, do these things. Write the pair of numerals together as one numeral. Decide whether the numeral expresses a rate, a comparison, or a fraction. Write the words you use to read the numeral. For Exercise A you write: "$\frac{1}{2}$, fraction, one half."

A June cut an orange into 2 equal pieces. She ate 1 of the pieces.

B In 2 hours Jim rode 9 mi. on his bicycle.

C Bob had $2, and Paul had $5.

D May's mother bought 2 cans of orange juice for 37¢.

E Susan folded a piece of paper into 16 equal squares. She colored 10 of the squares yellow.

F Nancy made 8 place mats. Mary made 16 place mats.

G Mrs. White used 2 teaspoonfuls of salt for 3 pounds of meat.

H Bill had 4 white mice, and John had 7 white mice.

I Patsy broke a chocolate bar into 6 equal pieces. She gave 3 of the pieces to Carol.

J Don sawed a board into 5 equal pieces. He used 4 of the pieces.

K In 2 hr. the Boy Scout troop hiked 5 mi.

L Andy practiced on his cornet for 30 min. Jim practiced for 50 min.

M June cut a pie into 6 equal pieces. Her family ate 4 of the pieces.

N Mrs. Bridges cut a small cake into 8 equal pieces. Jim ate 1 of the pieces.

O For which of the exercises above did you write a fraction numeral? For which did you write a ratio?

Using arithmetic

A Jim, Bob, Bill, and Tony each had a camera. Their cameras cost $2.89, $5.49, $3.98, and $2.96. How much did all the cameras cost?

B The most expensive camera cost how much more than the least expensive camera?

C Each of the boys bought an album for pictures. Each album cost $1.89. How much did all four albums cost?

D Tony sent 2 rolls of pictures to be developed and printed. There were 8 pictures on each roll. The cost was $.47 per roll. About how much did it cost to develop and print each picture?

E Bob was given $10 for his birthday. He bought a developing and printing set for $3.79. How much of the $10 did he have left?

F Jim planned to save his earnings and allowance to buy a better camera. His allowance was $.75 a week, and he earned $1.25 a week. How long would it take him to save enough to buy a camera priced at $8?

G Jim found that he could save only $.75 each week. At this rate, about how long would it take him to save enough to buy the camera he wanted?

H Bill earned some money by raking leaves. On his way home, he bought 2 rolls of film for 45¢ a roll. Then he had $.35 left. How much money had he earned by raking leaves?

I Bob paid 75¢ for 2 rolls of film, and Jim paid 85¢ for 2 rolls. What was the average cost per roll of the four rolls?

J After Jim had saved some money, his grandfather gave him $2. Then Jim had $5.30. How much money had Jim saved before his grandfather gave him the $2?

K How much more money did Jim need before he could buy the camera that he wanted?

THINK What was the price of the camera?

L Tony earned $3 one week. He bought 3 rolls of film. Then he had $2.13 left. How much had Tony paid for the film he bought?

M What did Tony pay per roll for the film he bought?

N Tony sent 3 rolls of film to be developed and printed. There were 8 pictures on each roll. When the pictures came back, he said, "Four of my pictures are spoiled." How many of his pictures were not spoiled?

O Each of the boys brought his best pictures to school. Jim brought 18, Bob brought 10, Bill brought 15, and Tony brought 12. How many pictures in all did the boys bring to school?

P Bob took a good picture of his dog. Then he had 3 large pictures made. They cost 40¢ each. How much did the 3 large pictures cost?

Q Jim had 15 prints made of one of his best pictures. He paid $1.20 for the 15 prints. How much did he pay per print?

R Jim had 112 pictures in his album. He put in more pictures, and then he had 135 pictures in his album. How many pictures had he added to his album?

Keeping skillful

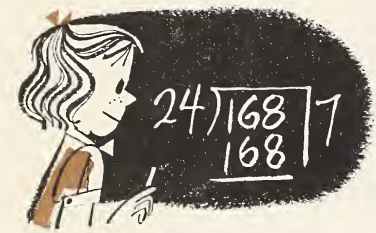
A $n + 2876 = 4100$
B $6004 - 2395 = n$
C $101 - n = 62$
D $529 + n = 804$
E $n - 680 = 1793$
F $4637 + 905 = n$
G $n - 1570 = 6231$
H $775 + n = 1025$
I $6276 + 1484 = n$
J $48253 - 21677 = n$
K $n + 6220 = 9640$
L $2345 - n = 1000$
M $n - 7482 = 6000$
N $1747 - n = 846$
O $8632 + n = 9000$
P $75040 - 61782 = n$
Q $n + 57601 = 71334$
R $27931 + n = 60040$
S $84010 - n = 47748$
T $n - 3641 = 5082$
U $61712 - 48935 = n$

Find the sum.

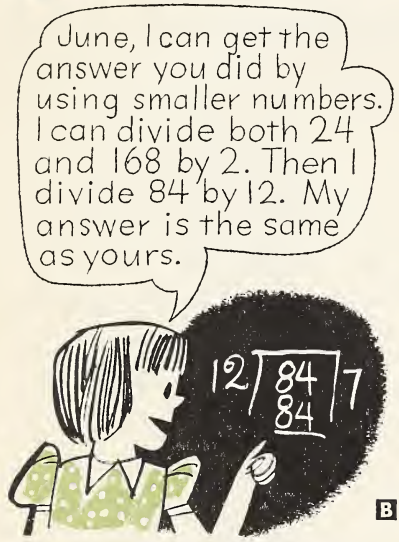
A 28, 64, 77, 16
B 586, 29, 716
C 338, 214, 501
D 6218, 327, 842
E 95, 103, 429
F 287, 624, 330
G 54, 100, 27, 302
H 704, 325, 82
I 66, 97, 13, 48
J 1002, 498, 216
K 99, 104, 62, 20
L 18, 46, 703, 52
M 746, 214, 560
N 42, 68, 105, 13
O 664, 215, 940
P 831, 269, 403, 795
Q 128, 374, 299, 560
R 678, 925, 379, 786
S 2738, 694, 3392
T 822, 340, 507, 851

A $206 \times 316 = n$
B $5544 \div n = 84$
C $6569 \div 93 = n$
D $568 \times 747 = n$
E $1776 \div n = 37$
F $7220 \div 76 = n$
G $85 \times 629 = n$
H $208 \times 432 = n$
I $7441 \div 58 = n$
J $25392 \div n = 92$
K $840 \times 821 = n$
L $4853 \div 47 = n$
M $4698 \div n = 81$
N $27413 \div 86 = n$
O $97 \times 408 = n$
P $5655 \div n = 87$
Q $348 \times 527 = n$
R $7300 \div 19 = n$
S $805 \times 972 = n$
T $7112 \div n = 14$
U $680 \times 755 = n$

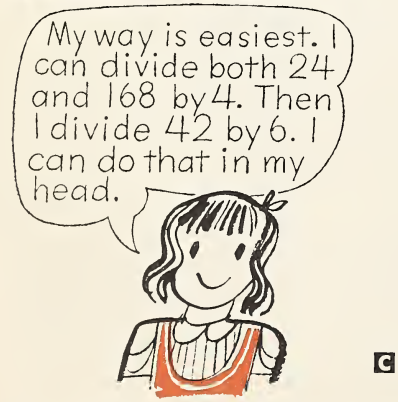
Thinking straight



A


June, I can get the answer you did by using smaller numbers. I can divide both 24 and 168 by 2. Then I divide 84 by 12. My answer is the same as yours.
12 84 7
84

B



C

A Look at Picture A. Is June's division correct?

B In Picture B, Ann found smaller numbers that she could divide to get the same answer that June found. How did Ann get the 12? The 84?

C In Picture C, how did Nancy get the 42? The 6?

D Notice that in Picture B, Ann first divided both the 168 and the 24 by 2. In Picture C, Nancy first divided the 168 and the 24 by ▒.

E Now divide 216 by 24.

F Divide both 216 and 24 by 2. Now divide 108 by 12. Is the answer the same as when you divided 216 by 24?

G Divide both 216 and 24 by 4. Now divide 54 by 6. What do you notice about the answer?

H Imagine that you are going to divide a number by another number. What might you do to the two numbers so that you can work with smaller numbers and still get the same answer?

I To use this way of dividing, you need to know what numbers can be divided by other numbers. Divide 2, 4, 6, 8, and 10 by 2. Is there a remainder when you divide? Numbers that can be divided by 2 without remainders are even numbers. All other whole numbers are odd numbers. Are numbers that end in 2, 4, 6, 8, and 0 even numbers? Why?

J Which numbers below are even numbers? Which are odd numbers?

37 114 69 490 662 75 94 43 701

K To decide whether or not a number can be divided by 3 without a remainder, first find the sum of the figures in the number. Let us look at 318. The sum of 3, 1, and 8 is ▒. Next divide this sum, 12, by 3. Since there is no remainder when 12 is divided by 3, the number 318 can also be divided by 3 without a remainder. Divide 318 by 3.

L Can 117 be divided by 3 without a remainder? Add 1, 1, and 7. What do you do next? Divide 117 by 3.

M Which of the numbers below can be divided by 3 without remainders?
240 95 108 412 630 115

N To decide whether or not a number can be divided by 4 without a remainder, look at just the last two figures. If this part of the number can be divided by 4, the number itself can also be divided by 4. The last two figures in 216 are 16. There is no remainder when 16 is divided by 4. The number 216 can also be divided by 4. Divide 216 by 4.

O Which of the numbers below can be divided by 4 without remainders?
532 119 306 136 220 424

P Any number that ends in 0 or 5 can be divided by 5. Which numbers below can be divided by 5?
212 615 87 480 335 900

Q In Picture B, how did Ann know that she could divide both 24 and 168 by 2?

R What is the answer when you divide 54 by 9? Multiply both 54 and 9 by 2. Now divide 108 by 18. Is the answer the same as when you divide 54 by 9?

S What is the answer when you divide 72 by 8? Multiply both 72 and 8 by 4. Now divide 288 by ▒. Is the answer the same as when you divide 72 by 8?

T Now multiply both 72 and 8 by 7. Divide 504 by 56. Is the answer the same as when you divide 72 by 8?

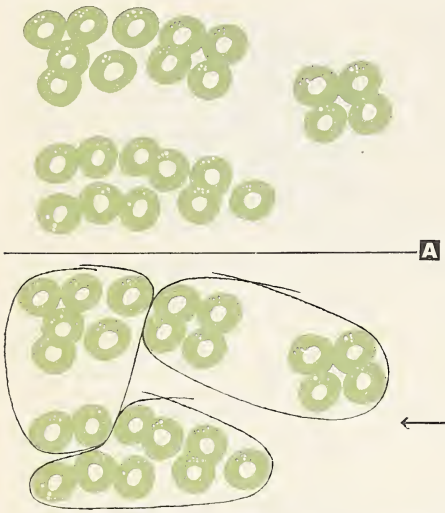
For each number below, tell whether you can divide it by 2, by 3, by 4, or by 5 without a remainder. For each number explain how you know.

A 82	E 735	I 87	M 444
B 231	F 253	J 816	N 74
C 700	G 532	K 41	O 225
D 590	H 946	L 104	P 508

Look at each division example below. For each one find the answer by using other numbers.

A $324 \div 36 = n$	H $162 \div 27 = n$
B $280 \div 40 = n$	I $120 \div 24 = n$
C $125 \div 25 = n$	J $250 \div 50 = n$
D $192 \div 24 = n$	K $504 \div 14 = n$
E $128 \div 16 = n$	L $3066 \div 42 = n$
F $252 \div 36 = n$	M $1935 \div 45 = n$
G $160 \div 40 = n$	N $1860 \div 30 = n$

Exploring problems



A Mary opened some packages of doughnuts. There were 8 in each package. When she counted the doughnuts, she found she had 24. How many packages had she opened?

Number of packages she opened
Number in each package

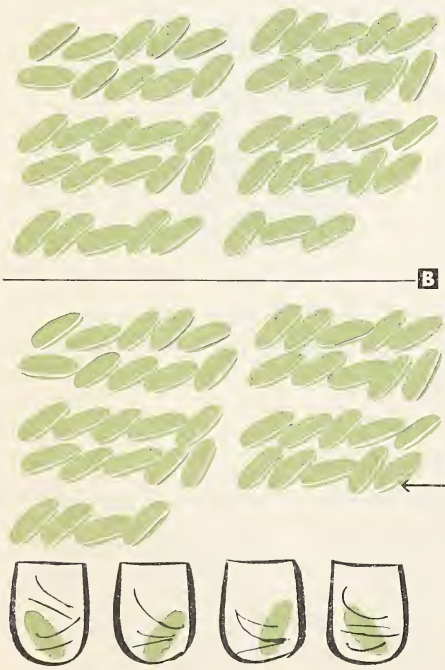
$n \times 8 = 24$

Number in all
You must find this number.

Imagine that the 24 doughnuts are put back into the groups of 8.

Divide 24 by 8. 24 divided by 8 equals 3.

Mary opened 3 packages of doughnuts.



B Mary opened 4 packages of buns. The same number of buns were in each package. When she counted the buns, she found she had 48. How many were in each package?

Number of packages she opened
Number in each package

$4 \times n = 48$

Number in all
You must find this number.

Imagine that the 48 buns are put back into the 4 packages. Every time a bun is put into each of the packages, 4 buns are used.

Divide 48 by 4. 48 divided by 4 equals 12.

There were 12 buns in each package.

C In Problem A you found what number 8 must be multiplied by to get 24. To find this, you divided 24 by ▒.

D In Problem B you found what number must be multiplied by 4 to get 48. To find this, you divided 48 by ▒.

E Sally emptied 5 bags of candy into a dish. Each bag held the same number of pieces. There were 60 pieces in all. How many pieces did each bag hold?

Number of groups.
Number in each group.
Number in all.

$5 \times n = 60$

You must find this number.

What number must be multiplied by 5 to get 60? Divide 60 by 5.

F Mrs. White poured juice from bottles into a pitcher. Each bottle held 24 fl. oz. Then there were 48 fl. oz. in the pitcher. How many bottles of juice had she poured out?

Number of groups.
Number of ounces in each group.
Number of ounces in all.

$n \times 24 = 48$

You must find this number.

To get 48, 24 must be multiplied by what number? Divide 48 by 24.

G For a number of days, Kathy put 5¢ a day into a bank. When she counted the money in the bank, she had $1.80. For how many days had she put 5¢ a day into the bank?

THINK $1.80 equals how many cents? By what number must you multiply 5 to get 180? Divide 180 by 5.

H For 6 days, Tony earned the same amount each day. Then he found that he had earned $2.40 in all. How much had he earned on each of the 6 days?

THINK $2.40 equals how many cents? What number must be multiplied by 6 to get 240? Divide 240 by 6.

A By what number must you multiply 32 to get 160?

B What number must be multiplied by 7 to get 112?

C What number must be multiplied by 10 to get 350?

D $n \times 15 = 75$
E $21 \times n = 84$
F $9 \times n = 108$
G $n \times 38 = 190$
H $43 \times n = 387$
I $n \times 7 = 322$
J $17 \times n = 85$
K $n \times 50 = 300$
L $33 \times n = 957$
M $n \times 65 = 910$
N $n \times 5 = 420$
O $58 \times n = 1218$

You have learned how to make new kinds of equations for problems about equal groups.

Moving forward

In this lesson you will learn how to change a pair of numerals to another pair of numerals that expresses the same rate or the same comparison.

A

Sally can buy 6 postcards for 10 cents. Does the pair of numerals at the right express the rate at which the postcards are sold?

$$\frac{6}{10}$$

B

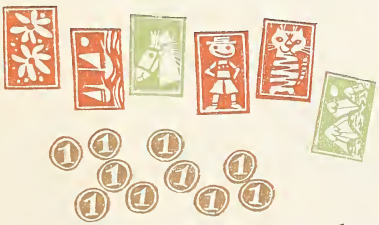
Now the 6 postcards and the 10 pennies have been divided into 2 equal groups. Think of 1 of the equal groups. Do the numerals at the right also express the rate at which the postcards are sold?

$$\frac{3}{5}$$

To get this other pair of numerals that expresses the same rate, you can divide both 6 and 10 by 2.

$6 \div 2 = 3$

$10 \div 2 = 5$



C

$$\frac{6}{10} = \frac{3}{5} \qquad 6 \text{ per } 10 = 3 \text{ per } 5$$

Sally bought 6 cards for 10 cents. The next day she bought 6 more cards with 10 more cents.
She bought 2×6 cards, or ▒ cards.
She paid $2 \times 10¢$, or ▒¢, for them.

Think of the whole group of cards Sally bought. Do the numerals at the right also express the rate at which the postcards are sold?

$\frac{12}{20}$

You can get these two new numerals to express the rate 6 per 10 by multiplying both 6 and 10 by 2.

$2 \times 6 = \square$ $\quad \frac{6}{10} = \frac{\square}{\square}$

$2 \times 10 = \square$

A You can find other ratios equal to the ratio at the right. One way is to divide both 12 and 8 by the same number. 4 is a number by which both 12 and 8 can be divided without a remainder.

$\frac{12}{8}$

$12 \div 4 = \square$ $\quad \frac{12}{8} = \frac{\square}{\square}$

$8 \div 4 = \square$

B By what other number can both 12 and 8 be divided?

$12 \div 2 = \square$ $\quad \frac{12}{8} = \frac{\square}{\square}$

$8 \div 2 = \square$

You can also find other ratios that are equal to the ratio 12 over 8 by multiplying both 12 and 8 by the same numbers.

C $3 \times 12 = \square$ $\quad \frac{12}{8} = \frac{\square}{\square}$

$3 \times 8 = \square$

D $5 \times 12 = \square$ $\quad \frac{12}{8} = \frac{\square}{\square}$

$5 \times 8 = \square$

E $10 \times 12 = \square$ $\quad \frac{12}{8} = \frac{\square}{\square}$

$10 \times 8 = \square$

For each ratio below, write a ratio equal to it. Use numbers smaller than the ones given. In Example A, you could use 8 and 10, or 4 and $\square$.

A $\frac{16}{20}$ B $\frac{9}{12}$ C $\frac{24}{20}$ D $\frac{30}{20}$

E $\frac{5}{15}$ F $\frac{25}{15}$ G $\frac{9}{21}$ H $\frac{16}{4}$

For each ratio below, write another ratio equal to it. Use numbers larger than the ones given.

I $\frac{4}{3}$ J $\frac{2}{5}$ K $\frac{4}{9}$ L $\frac{3}{10}$

M $\frac{7}{8}$ N $\frac{1}{6}$ O $\frac{12}{5}$ P $\frac{9}{2}$

Q $\frac{1}{2}$ R $\frac{7}{3}$ S $\frac{5}{7}$ T $\frac{5}{1}$

A Look at the ratio below. It is expressed by the numerals 9 and 6. Then another ratio equal to it is written with other numerals. One of them, 18, has been found for you. You must find the missing numeral.

$\frac{9}{6} = \frac{18}{\square}$ ← You must find this numeral.

By what number was 9 multiplied to get 18?

$\square \times 9 = 18$

$2 \times 9 = 18$ $\quad \frac{9}{6} = \frac{18}{12}$

$2 \times 6 = 12$

Now turn the page.

B $\frac{3}{4}=\frac{\square}{16}$

$\square \times 4 = 16$
$4 \times 4 = 16$
$4 \times 3 = 12$

$\frac{3}{4}=\frac{\square}{16}$

C $\frac{10}{15}=\frac{2}{\square}$

By what number was 10 divided to get 2?

$10 \div \square = 2$
$10 \div 5 = 2$
$15 \div 5 = 3$

$\frac{10}{15}=\frac{2}{3}$

D $\frac{35}{56}=\frac{\square}{8}$

$56 \div \square = 8$
$56 \div 7 = 8$
$35 \div 7 = 5$

$\frac{35}{56}=\frac{\square}{8}$

Find the missing numeral in each example below.

A $\frac{14}{16}=\frac{\square}{8}$ **G** $\frac{7}{4}=\frac{\square}{8}$ **M** $\frac{15}{9}=\frac{5}{\square}$

B $\frac{5}{3}=\frac{10}{\square}$ **H** $\frac{6}{25}=\frac{18}{\square}$ **N** $\frac{16}{30}=\frac{\square}{15}$

C $\frac{3}{4}=\frac{\square}{20}$ **I** $\frac{28}{21}=\frac{4}{\square}$ **O** $\frac{24}{36}=\frac{2}{\square}$

D $\frac{4}{12}=\frac{\square}{3}$ **J** $\frac{9}{18}=\frac{1}{\square}$ **P** $\frac{8}{15}=\frac{24}{\square}$

E $\frac{6}{1}=\frac{12}{\square}$ **K** $\frac{10}{16}=\frac{5}{\square}$ **Q** $\frac{9}{1}=\frac{\square}{5}$

F $\frac{1}{2}=\frac{5}{\square}$ **L** $\frac{21}{24}=\frac{7}{\square}$ **R** $\frac{3}{23}=\frac{6}{\square}$

When you multiply or divide both numerals in a ratio by the same number, you get another pair of numerals that expresses the same rate or the same comparison.

Keeping skillful

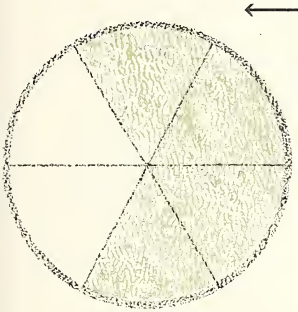
A $27+41+58+30=n$
B $64+33+72+49=n$
C $50+76+48+25=n$
D $16+24+52+19=n$
E $87+45+91+78=n$
F $138+429+226=n$
G $370+201+298+116=n$
H $406+355+372+289=n$
I $697+700+458+537=n$
J $888+483+761+92=n$

A $421+n=700$
B $n+2693=5104$
C $8370-n=3096$
D $n-934=6077$
E $15008-7261=n$
F $n+4279=33400$
G $n-8410=25000$
H $5729+n=7886$
I $40869-27098=n$
J $73392-n=48975$

A $7 \times 59 = n$
B $5 \times 608 = n$
C $n \times 8 = 288$
D $67 \times 73 = n$
E $n \times 15 = 810$
F $1063 \div 62 = n$
G $2964 \div n = 39$
H $3705 \div 9 = n$
I $4015 \div n = 5$
J $45 \times 104 = n$

Moving forward

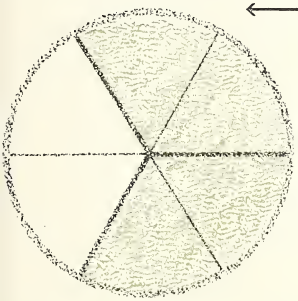
In this lesson you will learn how to change a fraction numeral to another fraction numeral that expresses the same fraction.



A

The piece of paper in Picture A is marked off into ▒ equal parts.
What fraction of the paper is green?

Now imagine that the same paper has been marked off into only 3 equal parts. Each part is $\frac{1}{3}$ of the paper.
How many one sixths are in each $\frac{1}{3}$?
Can you still say that $\frac{4}{6}$ of the paper is green?
Is $\frac{2}{3}$ of the paper green?



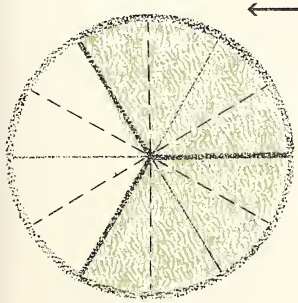
B

You can change $\frac{4}{6}$ to thirds by dividing the 6 and the 4 in $\frac{4}{6}$ by 2.

$6 \div 2 = 3$
$4 \div 2 = 2$

$\frac{4}{6} = \frac{2}{3}$

Now imagine that the same piece of paper has been marked off into 12 equal parts. Each part is $\frac{1}{12}$ of the paper. How many one twelfths are in each $\frac{1}{6}$?
Is $\frac{8}{12}$ of the circle green?
Is $\frac{4}{6}$ of the circle green?



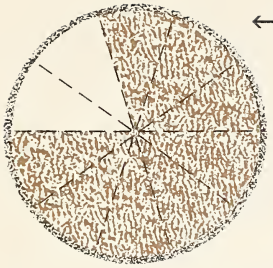
C

You can change $\frac{4}{6}$ to twelfths by multiplying the 6 and the 4 in $\frac{4}{6}$ by 2.

$2 \times 6 = 12$
$2 \times 4 = 8$

$\frac{4}{6} = \frac{8}{12}$

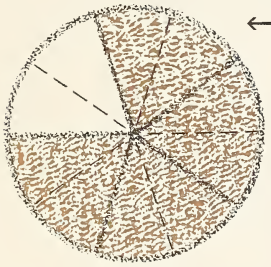
$\frac{2}{3}$, $\frac{4}{6}$, and $\frac{8}{12}$ all express the fraction of the paper that is green.



D Here is a new piece of paper marked off into tenths. What fraction of this paper is brown?

Now imagine that the same paper has been marked off into 5 equal parts. Each part is $\frac{\square}{\square}$ of the paper.

$\frac{\square}{10}$ of the paper is brown. $\frac{\square}{5}$ of the paper is brown.



E You can change $\frac{8}{10}$ to fifths by dividing both 10 and 8 by 2.

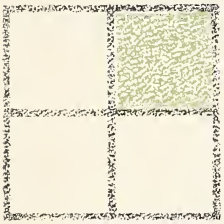
$10 \div 2 = \square$

$8 \div 2 = \square$

$\frac{8}{10} = \frac{\square}{\square}$

You have divided both the denominator and the numerator of $\frac{8}{10}$ by 2 to get another fraction numeral that expresses the same fraction.

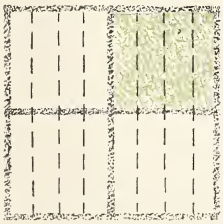
F



This square piece of paper is marked off into ~~~~. What fraction of this square is green?

The square has now been marked off into 16 equal parts.

$\frac{\square}{4}$ of the square is green. $\frac{\square}{16}$ of the square is green.



G You can change $\frac{1}{4}$ to sixteenths by multiplying both 4 and 1 by 4.

$4 \times 4 = \square$

$4 \times 1 = \square$

$\frac{1}{4} = \frac{\square}{\square}$

You have multiplied both the denominator and the numerator of $\frac{1}{4}$ by 4 to get another fraction numeral that expresses the same fraction.

A You can find many fraction numerals that are equal to $\frac{12}{16}$. One way to find such a numeral is to divide the denominator and the numerator by the same number. 16 and 12 can both be divided by 4.

$16 \div 4 = \square$
$12 \div 4 = \square$ $\quad \frac{12}{16} = \frac{\square}{\square}$

B By what other number can both 16 and 12 be divided?

$16 \div 2 = \square$
$12 \div 2 = \square$ $\quad \frac{12}{16} = \frac{\square}{\square}$

You can also find other fraction numerals equal to $\frac{12}{16}$ by multiplying both the denominator and the numerator by the same number.

C $2 \times 16 = \square$
$2 \times 12 = \square$ $\quad \frac{12}{16} = \frac{\square}{\square}$

D $3 \times 16 = \square$
$3 \times 12 = \square$ $\quad \frac{12}{16} = \frac{\square}{\square}$

E $5 \times 16 = \square$
$5 \times 12 = \square$ $\quad \frac{12}{16} = \frac{\square}{\square}$

For each example below, write a fraction numeral that is equal to the fraction numeral given, but use a smaller denominator. For Example A you could write $\frac{3}{6}$. You could also write $\frac{\square}{\square}$.

A $\frac{9}{18}$	**E** $\frac{6}{10}$	**I** $\frac{15}{27}$	**M** $\frac{16}{24}$
B $\frac{18}{24}$	**F** $\frac{10}{15}$	**J** $\frac{25}{35}$	**N** $\frac{18}{27}$
C $\frac{14}{16}$	**G** $\frac{9}{12}$	**K** $\frac{16}{40}$	**O** $\frac{24}{28}$
D $\frac{6}{12}$	**H** $\frac{16}{20}$	**L** $\frac{21}{36}$	**P** $\frac{15}{20}$

Now write a fraction numeral that is equal to the fraction numeral given, but use a larger denominator.

A $\frac{2}{5}$	**D** $\frac{5}{8}$	**G** $\frac{1}{3}$	**J** $\frac{3}{10}$
B $\frac{5}{6}$	**E** $\frac{4}{9}$	**H** $\frac{3}{4}$	**K** $\frac{11}{12}$
C $\frac{1}{4}$	**F** $\frac{2}{7}$	**I** $\frac{1}{2}$	**L** $\frac{9}{10}$

A The same fraction is written in two ways below. First it is written as $\frac{3}{8}$. Then it is written with the denominator 16, but you must find the missing numerator.

$\frac{3}{8} = \frac{\square}{16}$ ← You must find this number.

By what number was 8 multiplied to get 16?

$2 \times 8 = 16$
$2 \times 3 = 6$ $\quad \frac{3}{8} = \frac{6}{16}$

B $\frac{9}{15} = \frac{\square}{5}$

By what number was 15 divided to get 5?

$15 \div 3 = 5$
$9 \div 3 = 3$ $\quad \frac{9}{15} = \frac{3}{5}$

C $\frac{1}{4} = \frac{5}{\square}$

$\square \times 1 = 5$
$5 \times 1 = 5$ $\quad \frac{1}{4} = \frac{5}{\square}$
$5 \times 4 = 20$

D $\frac{14}{20} = \frac{7}{\square}$

$14 \div \square = 7$ $\quad \frac{14}{20} = \frac{7}{\square}$
$20 \div \square = \square$

A $\frac{4}{5}=\frac{\square}{10}$ D $\frac{1}{2}=\frac{\square}{16}$ G $\frac{2}{3}=\frac{\square}{9}$ J $\frac{5}{15}=\frac{\square}{3}$ M $\frac{21}{24}=\frac{\square}{8}$ P $\frac{12}{15}=\frac{4}{\square}$

B $\frac{9}{12}=\frac{3}{\square}$ E $\frac{4}{20}=\frac{1}{\square}$ H $\frac{5}{8}=\frac{10}{\square}$ K $\frac{1}{2}=\frac{7}{\square}$ N $\frac{3}{4}=\frac{\square}{20}$ Q $\frac{1}{8}=\frac{\square}{16}$

C $\frac{1}{6}=\frac{3}{\square}$ F $\frac{3}{8}=\frac{\square}{24}$ I $\frac{2}{10}=\frac{1}{\square}$ L $\frac{20}{24}=\frac{\square}{6}$ O $\frac{2}{9}=\frac{6}{\square}$ R $\frac{12}{21}=\frac{\square}{7}$

When you multiply or divide the denominator and the numerator of a fraction numeral by the same number, you get another fraction numeral that expresses the same fraction.

Thinking straight

A Both 12 and 18 can be divided by three numbers besides 1. What are the numbers?

B Both 10 and 16 can be divided by ▭.

C Both 12 and 16 can be divided by ▭ and ▭.

D Both 20 and 30 can be divided by ▭, ▭, and ▭.

What is the largest number by which each of these pairs of numbers can be divided without a remainder?

E 10, 15
F 20, 24
G 24, 32
H 10, 18
I 15, 20
J 9, 21
K 8, 16
L 10, 20
M 16, 24

A $\frac{15}{20}=\frac{3}{4}$. By what number were both 15 and 20 divided? Is there any number besides 1 by which both 3 and 4 can be divided without a remainder?

B $\frac{20}{24}=\frac{10}{12}$. By what number were 20 and 24 divided? By what number can 10 and 12 also be divided?

C $\frac{10}{12}=\frac{5}{6}$. Because 5 and 6 cannot be divided without a remainder by any number except 1, we say that $\frac{5}{6}$ is in simplest form. Is $\frac{3}{7}$ in simplest form? How do you know?

Which fraction numerals below are in simplest form? How do you know?

D $\frac{4}{5}$ F $\frac{3}{10}$ H $\frac{4}{6}$ J $\frac{1}{8}$

E $\frac{8}{12}$ G $\frac{11}{16}$ I $\frac{6}{15}$ K $\frac{9}{12}$

Change to simplest form.

A $\frac{5}{15}$ F $\frac{6}{10}$ K $\frac{16}{24}$ P $\frac{14}{18}$

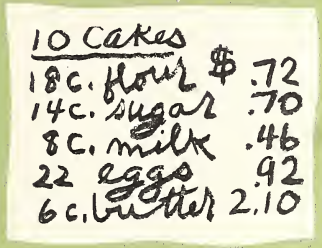
B $\frac{4}{6}$ G $\frac{12}{18}$ L $\frac{12}{15}$ Q $\frac{24}{30}$

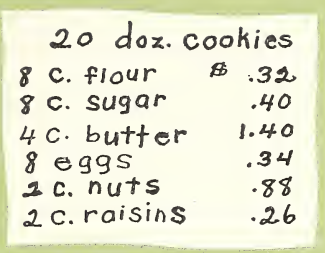
C $\frac{9}{12}$ H $\frac{6}{12}$ M $\frac{10}{20}$ R $\frac{21}{24}$

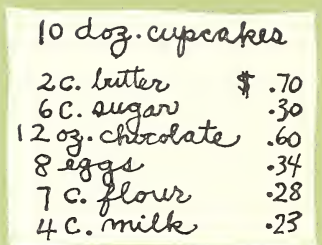
D $\frac{12}{16}$ I $\frac{3}{9}$ N $\frac{18}{24}$ S $\frac{10}{16}$

E $\frac{16}{20}$ J $\frac{4}{20}$ O $\frac{6}{16}$ T $\frac{25}{30}$

Thinking straight







A To raise money, the fifth-grade girls helped their mothers bake cakes and cookies for a school fair. The cost of the materials they used is shown above. What was the cost of all the materials for cakes? For cookies? For cupcakes?

B Find the total cost of the materials for cakes, cookies, and cupcakes.

C The girls had to decide how much to charge for the cakes, cookies, and cupcakes. They wanted to set a price so that they would have some money left over after the materials were paid for. The money left over would be their profit. They decided to sell the cakes at 95¢ apiece. What profit did they expect to make on the 10 cakes?

D They priced the cookies to sell at 50¢ a dozen. Find the profit they expected to make on the 20 doz. cookies.

E They decided to sell the cupcakes at 5¢ apiece. What profit did they expect to make on all the cupcakes?

F The girls sold all the cakes, 19 doz. cookies, and 104 cupcakes. How much money did they get in all?

G Find the girls' total profit.

H The fifth-grade boys made 12 birdhouses. They spent $11.52 for wood, paint, and other materials. What was the average cost per birdhouse?

I The boys sold 5 of the birdhouses at $2.25 apiece. How much money did they get for the 5 birdhouses?

J Since the boys got less money for the 5 birdhouses that they sold than it cost to make all the birdhouses, they had a loss instead of a profit. How much was the loss?

K How much profit did the fifth-grade boys and girls make in all?

Moving forward

This lesson will explain how fraction numerals can be used to show one whole thing or more than one whole thing.

A You can use the numerals 2 and ▒ to tell what fraction of the paper disk is red.

What does the 5 show? → 5 ← What does the 2 show? → 2

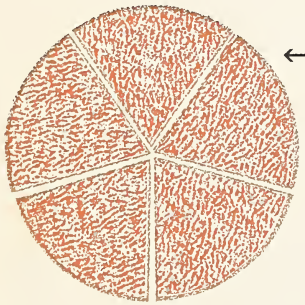
$\frac{2}{5}$

two fifths

Is $\frac{2}{5}$ less than 1?

A fraction numeral like $\frac{2}{5}$, that stands for less than a whole thing, or less than 1, is a proper fraction.

B



Each disk has been cut into 5 equal parts. Each of these parts is $\frac{1}{5}$ of a whole disk. How many of these one fifths are red?

You can use the numerals 7 and 5 to tell what fraction of these disks is red.

What does the 5 show? → 5 ← What does the 7 show? → 7

$\frac{7}{5}$

seven fifths

Is $\frac{7}{5}$ more than 1?

A fraction numeral like $\frac{7}{5}$, that stands for more than a whole thing, or more than 1, is an improper fraction.

C You also can write the numeral shown below to tell how much of the disks is red.

The 1 shows 1 whole disk.

$1\frac{2}{5}$

The 2 shows you are thinking of 2 of the equal parts.

The 5 shows that the other disk was cut into 5 equal parts.

one and two fifths

$1\frac{2}{5}$ is a mixed number. It is made up of a whole number, 1, and a fraction, $\frac{2}{5}$. Does a mixed number stand for more than one whole thing?

You can see that the red parts of the disks in Pictures B and C are equal.

$\frac{7}{5} = 1\frac{2}{5}$

The cake has been cut into ▒ equal parts. Each part is $\frac{1}{▒}$ of the cake. How much of the cake is on the plate?

D You can write a fraction numeral to tell how much of the cake is on the plate.

What does this 9 show?

$\frac{9}{9}$

What does this 9 show?

nine ninths

Is $\frac{9}{9}$ equal to 1?

A fraction like $\frac{9}{9}$, that stands for a whole thing, or 1, is also an improper fraction.

$\frac{9}{9} = 1$

Which numerals stand for proper fractions?

A	B	C	D	E	F	G	H
$\frac{1}{4}$	$\frac{6}{6}$	$\frac{5}{3}$	$\frac{2}{7}$	$\frac{9}{10}$	$\frac{12}{10}$	$\frac{3}{5}$	$\frac{10}{16}$

Which numerals stand for improper fractions?

I	J	K	L	M	N	O	P
$\frac{3}{8}$	$\frac{7}{4}$	$\frac{2}{2}$	$\frac{4}{6}$	$\frac{19}{16}$	$\frac{13}{10}$	$\frac{5}{9}$	$\frac{12}{12}$

Which numerals stand for mixed numbers?

Q	R	S	T	U	V	W	X
$2\frac{2}{3}$	6	$\frac{5}{8}$	$1\frac{7}{10}$	$4\frac{1}{5}$	$\frac{8}{9}$	$7\frac{3}{8}$	$\frac{5}{6}$

A Write 5 proper fractions.

B Write 5 improper fractions.

C Write 5 mixed numbers.

Write the numerals.

A one and nine tenths

B eight eighths

C six and one third

D nine fourths

E two halves

F seven and five twelfths

G one and three sixteenths

H four fourths

I three and one half

J twelve twelfths

K nine fifteenths

L seven and two thirds

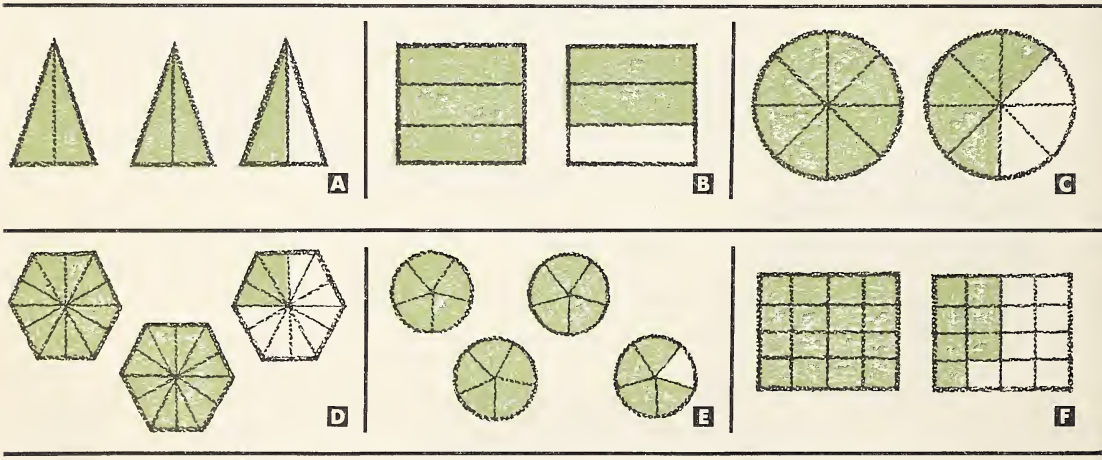
M eleven fifths

N one eighth

O eight and eleven twelfths

P fourteen tenths

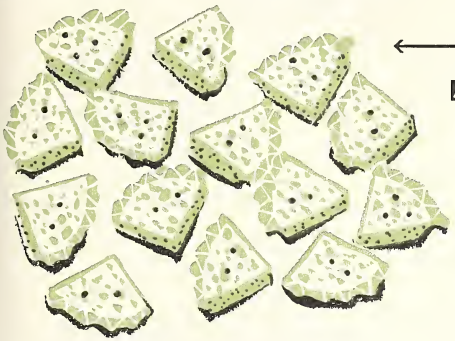
For each picture below, write two numerals that tell how much of the pieces of paper is green. You can write $2\frac{1}{2}$ and $\frac{5}{2}$ for Picture A.



Now you should be able to read and write any fraction numeral or mixed number.

Moving forward

You will now learn how to change any improper fraction to an equal mixed number or whole number.



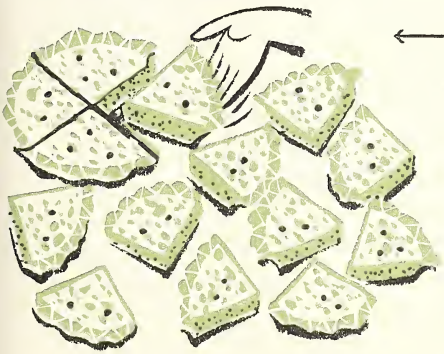
A

Each piece of pie in Picture A is $\frac{1}{4}$ of a whole pie. There are 14 fourths.

The 4 shows that each pie was cut into 4 equal parts.

$\frac{14}{4}$

The 14 shows that there are 14 equal parts.



B

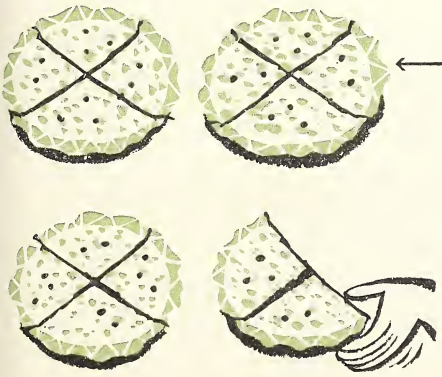
Now the fourths are being arranged as whole pies.

This 4 shows that each pie was divided into 4 equal parts.

$\frac{4}{4}$

This 4 shows that 4 fourths are used to make one whole.

It takes 4 fourths to make 1 whole. $\frac{4}{4} = 1$.



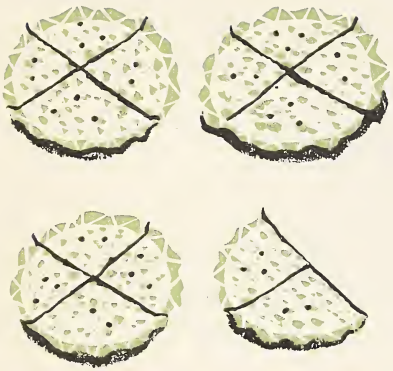
C

The 14 fourths have been arranged as 3 whole pies and 2 fourths of another pie.

To find how many wholes, or ones, there are in 14 fourths, divide the 14 by the 4.

$14 \div 4 = 3$ and 2 remainder. There are 3 ones, and 2 fourths are left over.

Now turn the page.



D

The 14 fourths equal 3 pies and 2 fourths of another pie.

$\frac{14}{4}$ = 3 ones and 2 fourths

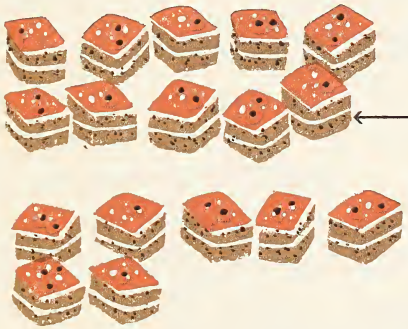
The 3 stands for the three wholes, or 3 ones.

The 4 shows that each pie was divided into 4 equal parts.

$3\frac{2}{4}$

The 2 stands for the two equal parts that are left over.

$\frac{14}{4} = 3\frac{2}{4}$. $3\frac{2}{4}$ in simplest form is $3\frac{1}{2}$.



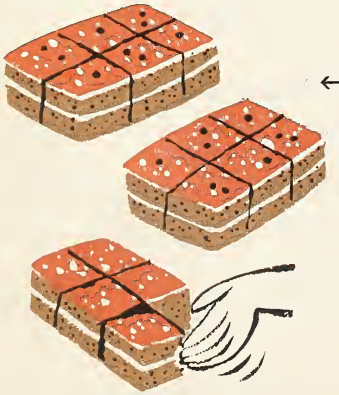
E

Each piece of cake in Picture E is $\frac{1}{6}$ of a whole cake. There are ▒ sixths.

The 6 shows that each cake was cut into ▒ equal parts.

$\frac{17}{6}$

The 17 shows that there are ▒ equal parts.



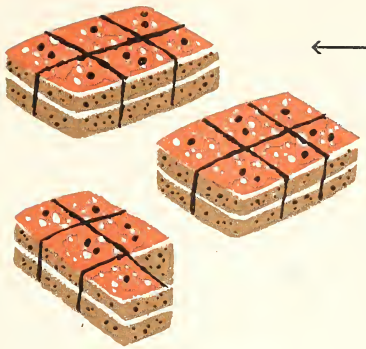
F

The 17 sixths have been arranged as ▒ whole cakes and ▒ sixths of another cake.

It takes 6 sixths to make one whole. $\frac{6}{6}$ = ▒.

To find how many wholes, or ones, there are in 17 sixths, divide ▒ by 6.

17 ÷ 6 = 2 and ▒ remainder. There are ▒ whole cakes, and ▒ pieces are left over.



G

The 17 sixths equal 2 cakes and 5 sixths of another cake.

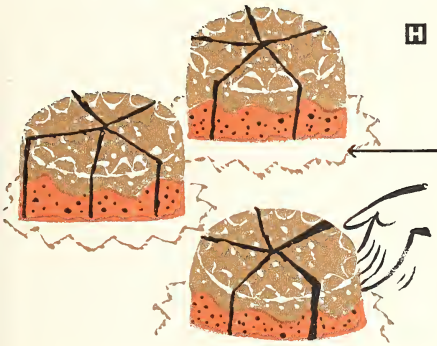
$\frac{17}{6}$ = 2 ones and ▒ sixths

The 2 stands for the two wholes, or 2 ones.

The 6 shows that each cake was cut into 6 equal parts.

$2\frac{5}{6}$

The 5 stands for the 5 equal parts that are left over.



H

$\frac{17}{6} = 2\frac{▒}{6}$

15 fifths have been arranged as ▒ whole cakes. It takes 5 fifths to make 1 whole. $\frac{5}{5}$ = ▒.

To find how many wholes, or ones, there are in 15 fifths, divide ▒ by ▒.

$15 \div 5 =$ ▒ $\quad \frac{15}{5} = 3$

A To change $\frac{18}{6}$ to a whole number or a mixed number, divide 18 by ▒.

B To change $\frac{23}{10}$ to a whole number or a mixed number, divide ▒ by ▒.

C When you divide to change $\frac{17}{5}$ to a whole number or a mixed number, does the 3 you get stand for ones or for fifths?

D When you change $\frac{19}{8}$ to a mixed number, the denominator of the fraction is ▒.

Write each improper fraction below as a whole number or a mixed number.

A	B	C	D	E	F
$\frac{13}{2}$	$\frac{16}{4}$	$\frac{12}{6}$	$\frac{11}{8}$	$\frac{36}{8}$	$\frac{6}{6}$
G	**H**	**I**	**J**	**K**	**L**
$\frac{9}{6}$	$\frac{24}{8}$	$\frac{42}{5}$	$\frac{58}{7}$	$\frac{19}{3}$	$\frac{21}{6}$
M	**N**	**O**	**P**	**Q**	**R**
$\frac{24}{12}$	$\frac{33}{32}$	$\frac{18}{16}$	$\frac{16}{8}$	$\frac{12}{12}$	$\frac{25}{5}$
S	**T**	**U**	**V**	**W**	**X**
$\frac{48}{4}$	$\frac{16}{5}$	$\frac{21}{3}$	$\frac{56}{8}$	$\frac{16}{16}$	$\frac{18}{2}$

Now you should be able to change any improper fraction to an equal whole number or mixed number.

Using arithmetic

A When Tony's father and Paul's father took 8 boys on an overnight camping trip, all of them slept in tents. Each tent was large enough for 2 persons. How many tents did they have?

B Each tent weighed 5 lb. How much did all the tents weigh?

C Paul's father said that the tents were worth $14.75 each. How much were all the tents worth?

D For the trip, Tony bought 2 lb. of bacon at 58¢ per pound, 2 doz. eggs at 53¢ per dozen, and 3 cans of baked beans at 23¢ per can. How much did all these groceries cost?

E Don bought groceries, too. He bought 3 lb. of bananas at 15¢ per pound, 3 lb. of peaches at 21¢ per pound, and 1 doz. oranges for 43¢. How much in all did Don spend for groceries?

F Bill bought 3 lb. of hot dogs at 59¢ per pound and 2 doz. rolls at 25¢ per dozen. How much did he spend?

G Jim bought the milk for the trip. He bought 2 gal. at 77¢ per gallon and 2 qt. at 24¢ per quart. How much did the milk cost?

H How much did all the food for the trip cost?

I The boys drank 20 cups of milk for supper and used the rest of the milk the next morning to make cocoa. How many cups of milk did they use to make cocoa?

THINK How many cups of milk did Jim buy for the trip?

J Paul's mother had made 18 yellow cupcakes and 12 chocolate cupcakes for the trip. She had made an average of how many cupcakes per person?

K After supper 7 cupcakes were left. How many cupcakes had been eaten?

L By the time the camping party got home, they had driven 87 mi. The round trip had taken about 3 hr. The party had traveled an average of about how many miles per hour?

M The camping party spent about 18 hr. in the woods. They were away from home how many more or how many fewer hours than 1 day?

THINK First add 18 to 3. Why?

N Don spent $2.75 for a cooking kit, 49¢ for a matchbox, and $1.15 for a compass. He spent how much in all for this camping equipment?

O Bill spent $2.50 for a canteen, $1.75 for an eating kit, and $1.25 for a first-aid kit. He spent how much more for camping equipment than Don?

P Tony has $1.47. He wants to buy a first-aid kit and an eating kit like Bill's. How much more money does he need?

Q Paul's brother used some of his savings to buy a sleeping bag. After he had spent $16.50 for the sleeping bag, he had $3.50 of his savings left. How much money had he saved?

R Paul is saving 15¢ per week to buy a large canteen that costs $3. How long will it take Paul to save enough money to buy the canteen?

S George earned 85¢. Then he had enough money to buy a knapsack that cost $3.45. How much money did he have before he earned the 85¢?

T Jack had $5. He bought a knapsack like George's and a first-aid kit like Bill's. How much money did he have left?

U Dick sold an old pair of field glasses to Jim for $1.50. Dick had paid $2.95 for the field glasses. He sold them for how much less than he had paid for them?

Checking up

Test 1

Think of these numerals as either fraction numerals or as ratios. In each example, find the missing numeral.

A $\frac{3}{1} = \frac{15}{\square}$

B $\frac{10}{14} = \frac{\square}{7}$

C $\frac{2}{3} = \frac{\square}{24}$

D $\frac{20}{25} = \frac{4}{\square}$

E $\frac{1}{7} = \frac{\square}{21}$

F $\frac{5}{8} = \frac{15}{\square}$

G $\frac{6}{5} = \frac{\square}{30}$

H $\frac{18}{12} = \frac{6}{\square}$

I $\frac{20}{15} = \frac{\square}{3}$

J $\frac{5}{11} = \frac{45}{\square}$

K $\frac{28}{4} = \frac{7}{\square}$

L $\frac{3}{39} = \frac{\square}{13}$

M $\frac{15}{3} = \frac{5}{\square}$

N $\frac{42}{4} = \frac{\square}{2}$

O $\frac{7}{8} = \frac{\square}{32}$

P $\frac{10}{15} = \frac{20}{\square}$

Test 2

Change each of these fraction numerals to simplest form.

A $\frac{4}{6}$

B $\frac{3}{9}$

C $\frac{2}{4}$

D $\frac{6}{10}$

E $\frac{6}{8}$

F $\frac{8}{18}$

G $\frac{10}{20}$

H $\frac{8}{12}$

I $\frac{6}{16}$

J $\frac{10}{15}$

K $\frac{8}{24}$

L $\frac{18}{20}$

M $\frac{6}{15}$

N $\frac{8}{10}$

O $\frac{6}{12}$

P $\frac{20}{24}$

Q $\frac{18}{30}$

R $\frac{12}{14}$

Test 3

Express each of these improper fractions as a mixed number or as a whole number.

A $\frac{29}{4}$

B $\frac{18}{6}$

C $\frac{28}{3}$

D $\frac{19}{5}$

E $\frac{10}{10}$

F $\frac{24}{16}$

G $\frac{11}{2}$

H $\frac{16}{4}$

I $\frac{39}{3}$

J $\frac{8}{8}$

K $\frac{42}{6}$

L $\frac{13}{4}$

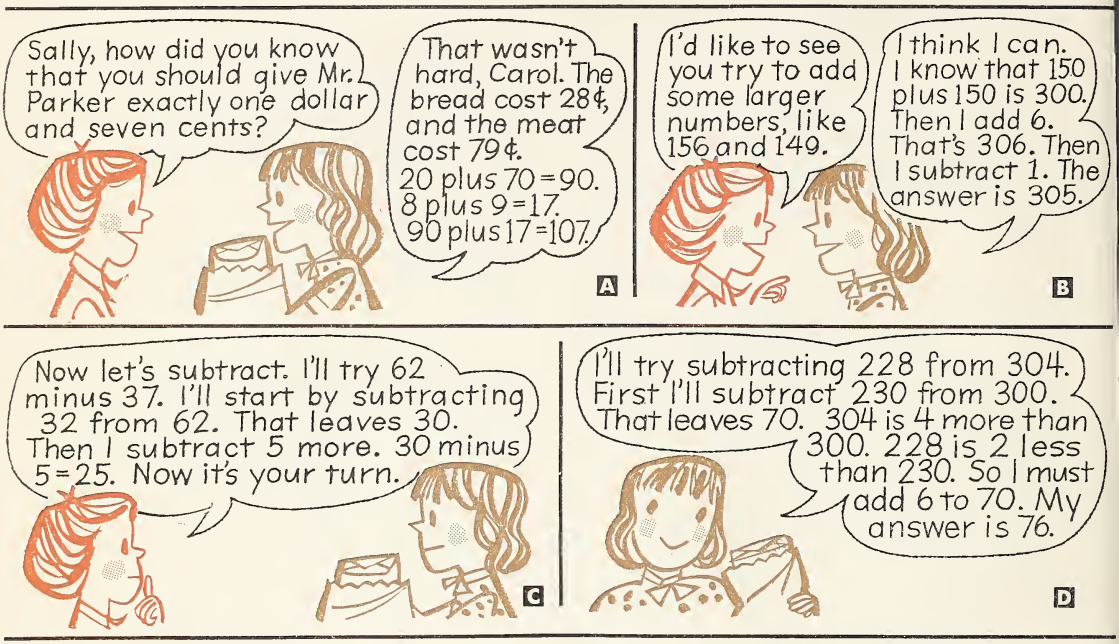
M $\frac{28}{6}$

N $\frac{63}{8}$

O $\frac{42}{12}$

P $\frac{27}{5}$

Thinking straight


Sally, how did you know that you should give Mr. Parker exactly one dollar and seven cents?
That wasn't hard, Carol. The bread cost 28¢, and the meat cost 79¢. 20 plus 70 = 90. 8 plus 9 = 17. 90 plus 17 = 107.
A
I'd like to see you try to add some larger numbers, like 156 and 149.
I think I can. I know that 150 plus 150 is 300. Then I add 6. That's 306. Then I subtract 1. The answer is 305.
B
Now let's subtract. I'll try 62 minus 37. I'll start by subtracting 32 from 62. That leaves 30. Then I subtract 5 more. 30 minus 5 = 25. Now it's your turn.
C
I'll try subtracting 228 from 304. First I'll subtract 230 from 300. That leaves 70. 304 is 4 more than 300. 228 is 2 less than 230. So I must add 6 to 70. My answer is 76.
D

A In Picture A, why did Sally add 17 to 90? Think of another way to add 79 to 28.

B In Picture B, why did Sally add 6 to 300 and then subtract 1?

C Another way to add 149 to 156 is to begin by adding 100 to 160. The sum is ▒. Then add 50 to 260. What would you do next?

D In Picture C, why did Carol subtract 5? Think of another way to subtract 37 from 62.

E In Picture D, why did Sally have to add 6 to 70?

F Here is another way to subtract 228 from 304 in your head. Begin by subtracting 204 from 304. Why do you then have to subtract 24 from 100?

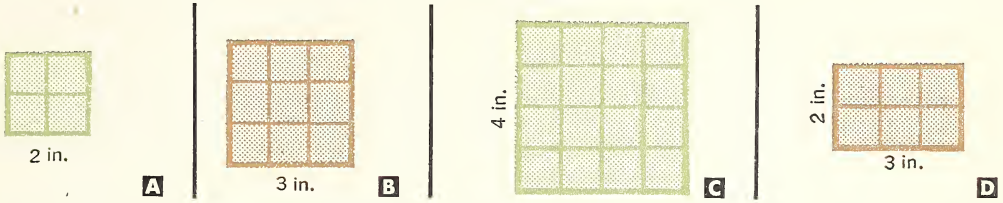
Add in your head.

A $42 + 34 = n$
B $19 + 50 = n$
C $24 + 26 = n$
D $73 + 48 = n$
E $132 + 255 = n$
F $307 + 193 = n$
G $289 + 196 = n$
H $475 + 375 = n$

Subtract in your head.

A $50 - 17 = n$
B $83 - 49 = n$
C $95 - 31 = n$
D $42 - 26 = n$
E $194 - 152 = n$
F $201 - 139 = n$
G $758 - 424 = n$
H $617 - 275 = n$

Thinking straight



A Pictures A, B, C, and D show polygons. Each polygon is a ~~~.

B Which rectangle is not a square?

C Imagine that the little squares covering each polygon shown above are square inches. What area is shown in each picture?

D How many squares the same size as Square A would fit on Square C?

E What is the length of each side of Square A? The perimeter of Square A is ▒ in.

F Find the perimeters of Polygons B, C, and D.

G The polygons in Picture E below are ~~~.

H Are the triangles in Picture E the same shape? Are they the same size?

I Find the perimeter of one of the triangles in Picture E.

J Pictures F and G below show what happens when the triangles in Picture E are put together. What kind of polygon do they form?

K How long is Side v of Polygon G? Side w? Side x? Side y? Line z?

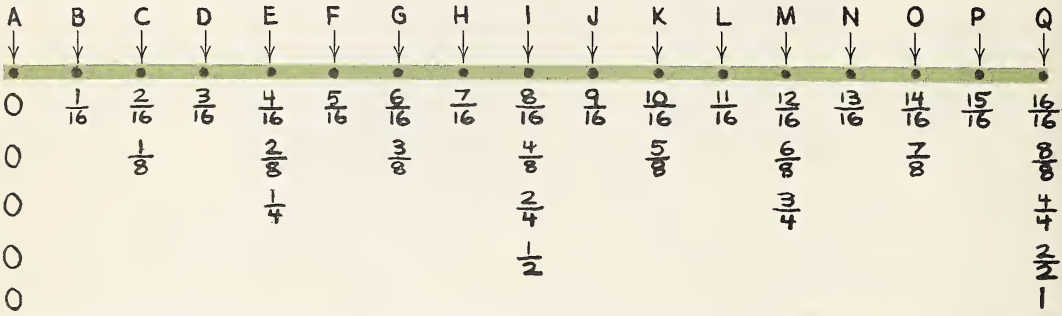
L The perimeter of Rectangle G is ▒ in.

M What is the area of Rectangle G?

N By using the pictures below, you can find the area of one of the triangles in Picture E. Try it.

Moving forward

A number line can be used to show whether one fraction is larger or smaller than other fractions.



A The picture above shows a number line. This number line ends with the number 1. It begins with what number?

B Arrows A, B, C, D, and so on show points that divide the line into equal parts. The fraction numerals below the points stand for parts of the line. Beginning with 0, read the fraction numerals that have 16 as the denominator. What point shows $\frac{4}{16}$ of the number line? $\frac{8}{16}$ of the number line? $\frac{12}{16}$ of the number line?

C Read the fraction numerals that have 8 as the denominator. What points show these parts of the number line?

D What point shows $\frac{2}{8}$ of the number line? $\frac{4}{8}$ of the line? $\frac{6}{8}$ of the line?

E Read the fraction numerals that have 4 as the denominator. What points show these parts of the number line?

F One point shows $\frac{1}{2}$, $\frac{2}{4}$, $\frac{4}{8}$, and $\frac{8}{16}$ of the number line. Name this point.

G The fraction numerals $\frac{8}{16}$, $\frac{4}{8}$, $\frac{2}{4}$, and $\frac{1}{2}$ stand for the same point on the number line. How does this show that the fraction numerals are equal?

H What point shows $\frac{6}{16}$ of the number line? What other fraction numeral stands for the same part of the number line? $\frac{6}{16} = \frac{\square}{\square}$

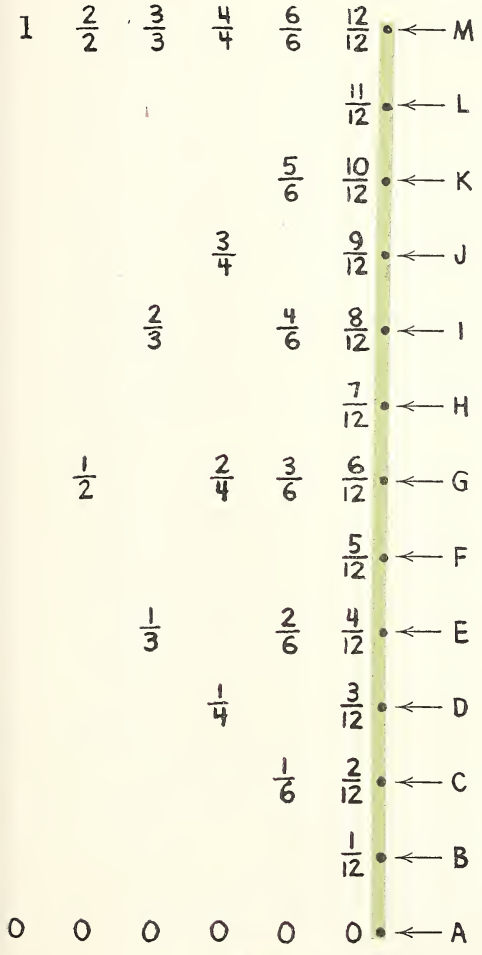
I What point shows $\frac{3}{4}$ of the number line? What other fraction numerals stand for the same part of the number line? $\frac{3}{4}$ equals what other fraction numerals?

J Which is more, $\frac{3}{4}$ of the number line or $\frac{5}{8}$ of the number line?

K Which is less, $\frac{1}{2}$ of the number line or $\frac{9}{16}$ of the number line?

L Look at the number line below. What do the fraction numerals at the left of the line stand for?

M How does this number line show that $\frac{6}{12}$, $\frac{3}{6}$, $\frac{2}{4}$, and $\frac{1}{2}$ are all names for the same part of the number line?



N What point shows $\frac{9}{12}$ of this number line? What other fraction numeral is equal to $\frac{9}{12}$?

O What point shows $\frac{2}{3}$ of the number line? What other fraction numerals equal $\frac{2}{3}$?

P Use the number line to tell whether $\frac{7}{12}$ is more than or less than $\frac{2}{3}$.

Q Use the number line to tell whether $\frac{1}{3}$ is more than or less than $\frac{5}{12}$.

R Is $\frac{2}{3}$ more than or less than $\frac{9}{12}$?

S Is $\frac{5}{6}$ more than or less than $\frac{1}{2}$?

T The fraction numerals $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ can be changed to twelfths. How does the number line show this?

U Draw a line 10 in. long. Make a number line, using tenths. For each part, use as many equal fraction numerals as you can. Into how many parts should you divide the line at first? What numeral should you begin with?

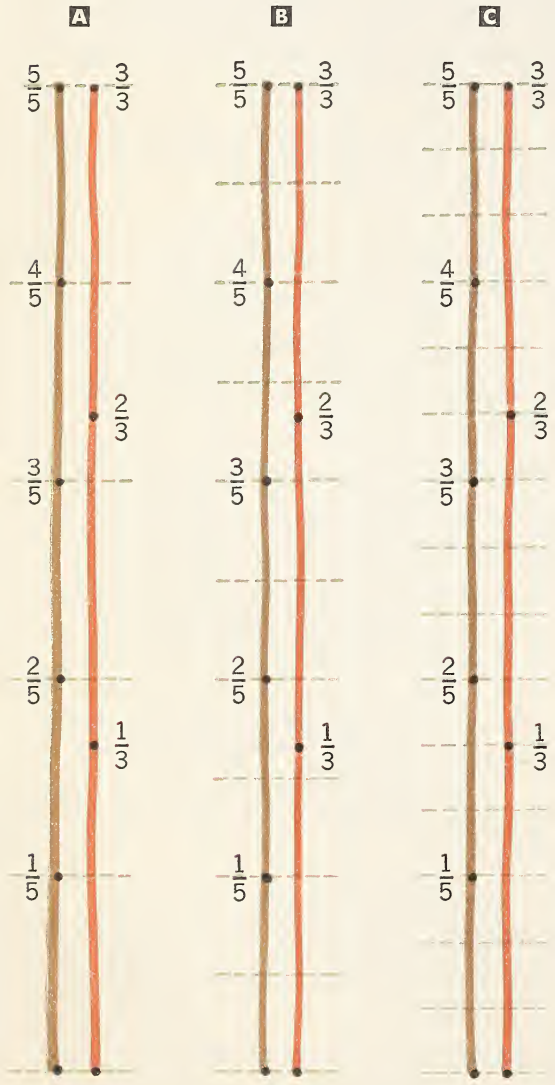
V What denominators should you use for the equal fraction numerals? Can you use thirds and fourths? Can you use halves and fifths?

W Draw another line 10 in. long. Use twentieths and as many other fraction numerals as you can to make another number line.

Now you know that you can compare fractions by arranging fraction numerals on a number line.

Moving forward

Now you will learn what denominator to use to find out which of two fractions is larger or smaller.



A Picture A shows two strings that are the same length. The brown string is divided into fifths. The red string is divided into thirds. Can you tell from the picture whether $\frac{3}{5}$ of the brown string is longer or shorter than $\frac{2}{3}$ of the red string? Can you tell how much longer or shorter it is?

B Notice in Picture A that the dotted lines divide both strings into fifths. Use the picture to count the number of fifths in $\frac{2}{3}$. Now can you tell how much shorter $\frac{3}{5}$ is than $\frac{2}{3}$? Why or why not?

C The same strings are shown in Picture B. The dotted lines show tenths. Count the tenths in $\frac{3}{5}$. Count the tenths in $\frac{2}{3}$. Now can you tell how much shorter $\frac{3}{5}$ is than $\frac{2}{3}$? Why or why not?

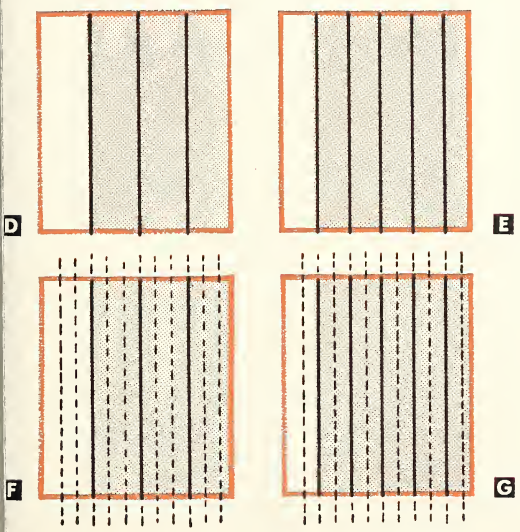
D Picture C shows the same strings again. The dotted lines show fifteenths. Count the fifteenths in $\frac{3}{5}$. Count the fifteenths in $\frac{2}{3}$. Now you should be able to tell how much shorter $\frac{3}{5}$ of the string is than $\frac{2}{3}$ of the string.

E In Picture A you cannot tell how many fifths there are in $\frac{2}{3}$. In Picture B you cannot tell how many tenths there are in $\frac{2}{3}$. Can you tell how many tenths there are in $\frac{3}{5}$?

F Now look at Picture C. Can you tell how many fifteenths there are in $\frac{2}{3}$? In $\frac{3}{5}$?

G Before you try to say how much smaller $\frac{3}{5}$ is than $\frac{2}{3}$, you change both fraction numerals to other fraction numerals with the denominator ▒. 15 is the common denominator because $\frac{3}{5}$ and $\frac{2}{3}$ can each be expressed as a number of fifteenths.

H Rectangles D, E, F, and G are all the same size. $\frac{▒}{4}$ of Rectangle D is red. $\frac{▒}{6}$ of Rectangle E is red.



I Now find whether $\frac{5}{6}$ is larger or smaller than $\frac{3}{4}$. You have learned that you can compare fractions when the fraction numerals you use have the same denominator. Do $\frac{3}{4}$ and $\frac{5}{6}$ have the same denominator?

J You should find a common denominator for $\frac{3}{4}$ and $\frac{5}{6}$. $\frac{5}{6}$ has the larger denominator. Can you express $\frac{3}{4}$ as a number of sixths? 6 is not a common denominator for $\frac{3}{4}$ and $\frac{5}{6}$.

K Pictures F and G show Rectangles D and E marked off in twelfths. Can you tell how many twelfths there are in $\frac{3}{4}$? In $\frac{5}{6}$? 12 is a common denominator for $\frac{3}{4}$ and $\frac{5}{6}$.

L $\frac{5}{6}=\frac{▒}{12}$. $\frac{3}{4}=\frac{▒}{12}$. Is $\frac{5}{6}$ larger or smaller than $\frac{3}{4}$?

M You can express $\frac{5}{6}$ as $\frac{15}{18}$. Could you use 18 as a common denominator when you compare $\frac{5}{6}$ and $\frac{3}{4}$? Why?

N Could you use 24 as a common denominator when you compare $\frac{5}{6}$ and $\frac{3}{4}$? Why?

O There are many denominators, such as 12, 24, 36, and 48, that you can use when comparing $\frac{5}{6}$ and $\frac{3}{4}$. 12, 24, 36, and 48 can all be divided by both 6 and 4 without a remainder. Use each of these four denominators to compare $\frac{5}{6}$ and $\frac{3}{4}$.

Now turn the page.

P When you compare fractions, it is usually easier to use the smallest common denominator. What is the smallest common denominator for $\frac{5}{6}$ and $\frac{3}{4}$?

Q Which is larger, $\frac{3}{4}$ or $\frac{7}{10}$? You should find a common denominator for $\frac{3}{4}$ and $\frac{7}{10}$. Should you use the larger denominator, 10, as a common denominator? Why or why not?

R Try 20 as a common denominator. Can 20 be divided by both 10 and 4? Can you tell how many twentieths there are in $\frac{7}{10}$? In $\frac{3}{4}$?

S $\frac{7}{10}=\frac{\square}{20}$. $\frac{3}{4}=\frac{\square}{20}$. Which is larger, $\frac{3}{4}$ or $\frac{7}{10}$?

T Which is smaller, $\frac{5}{6}$ or $\frac{11}{12}$? Can you use the larger denominator, 12, as a common denominator? Why or why not? $\frac{5}{6}=\frac{\square}{12}$. Which is smaller, $\frac{5}{6}$ or $\frac{11}{12}$?

U Which is larger, $\frac{5}{6}$ or $\frac{7}{8}$? Should you use 8 as a common denominator? Should you use 16?

V Try 24 as a common denominator. Can 24 be divided by both 6 and 8? $\frac{5}{6}=\frac{\square}{24}$. $\frac{7}{8}=\frac{\square}{24}$. Which is larger, $\frac{5}{6}$ or $\frac{7}{8}$?

For each pair of fraction numerals below, change the numerals so that they have a common denominator. Then for each pair decide which expresses the smaller fraction.

A	$\frac{2}{3}, \frac{4}{5}$	**E**	$\frac{4}{9}, \frac{1}{3}$	**I**	$\frac{7}{10}, \frac{2}{5}$	**M**	$\frac{1}{2}, \frac{4}{9}$
B	$\frac{1}{4}, \frac{3}{8}$	**F**	$\frac{7}{12}, \frac{3}{8}$	**J**	$\frac{1}{2}, \frac{7}{16}$	**N**	$\frac{5}{8}, \frac{2}{3}$
C	$\frac{3}{4}, \frac{11}{16}$	**G**	$\frac{1}{6}, \frac{3}{10}$	**K**	$\frac{11}{12}, \frac{3}{4}$	**O**	$\frac{5}{6}, \frac{7}{9}$
D	$\frac{5}{8}, \frac{9}{16}$	**H**	$\frac{7}{8}, \frac{3}{4}$	**L**	$\frac{2}{3}, \frac{9}{10}$	**P**	$\frac{2}{3}, \frac{7}{12}$

Now you should be able to find the larger or smaller of two fractions that have different denominators.

Keeping skillful

Find the sum.

A 8723, 604, 3160
B 48, 17, 23, 6, 57
C \$6.44, \$5.03, \$.98, \$1.02
D 9046, 7258
E 55, 493, 782, 64
F \$20.00, \$11.85, \$92.78
G 46, 19, 87, 402, 38
H \$7.40, \$32.96, \$87.12

A $n+5320=9100$
B $\$80.11-\$27.36=n$
C $n-402=6023$
D $5843+n=8240$
E $290-n=100$
F $\$52.08+n=\$75.36$
G $4310-3177=n$
H $n-\$9.94=\$5.40$
I $n+625=1001$

A $248\times107=n$
B $\$110.01\div n=57$
C $5731\div84=n$
D $65\times\$4.03=n$
E $776\times132=n$
F $\$45.08\div n=49$
G $5071\div43=n$
H $2844\div n=79$
I $803\times\$1.19=n$

Using arithmetic

A The fifth graders were reading about the people who went to California in 1849 and 1850 to look for gold. 37,570 men, 825 women, and 1126 children traveled through Fort Laramie on their way to California in the first 6 months of 1850. How many persons traveled through Fort Laramie in the 6 months?

B A total of 30,032 persons traveled through Fort Laramie in the year 1849. How many more people traveled through the town in the first 6 months of 1850 than in all of 1849?

C In 1850 the travelers had with them 31,502 oxen, 22,878 horses, 7650 mules, and 5754 cows. They had how many animals in all with them?

D Before the Cook family started for California, they planned to take with them as food for each person 150 lb. of flour, 150 lb. of bacon, 25 lb. of coffee, and 40 lb. of sugar. How many pounds of food did the Cooks plan to take with them for their family of four?

E Jim Burns sold 95 lb. of his flour. He still had 150 lb. for himself. How much flour had he to begin with?

F Jack Bell bought 17 lb. of coffee. Then he had the 25 lb. of coffee that he needed for himself. How many pounds had he to begin with?

G Mr. Cook bought 6 oxen for $65 apiece. How much did he pay for all of the oxen?

H He hoped to sell the oxen for $150 apiece when he got to California. He hoped to get how much more for the 6 oxen than he had paid for them?

I The Cook family joined a train of 14 wagons to make the trip. The first week the wagon train traveled 21 mi. on Monday, 19 mi. on Tuesday, 16 mi. on Wednesday, 18 mi. on Thursday, 14 mi. on Friday, 15 mi. on Saturday, and 16 mi. on Sunday. The first week the wagon train traveled an average of how many miles per day?

J Each man took 5 lb. of gunpowder and 10 lb. of lead. How much did all the gunpowder and lead weigh that the 25 men in the wagon train took?

K One week the wagon train traveled 126 mi. This was an average of how many miles per day?

L Many wagon trains traveled a distance of 2500 mi. If they traveled at the average speed given in Problem K, about how many days did it take them to get to California?

M Of the 59 persons who started out with the Cooks' wagon train, only 53 reached California. The rest died or turned back. How many persons died or turned back?

N Near the end of the trip the Cook family had only 17 lb. of bacon left for each person. How many pounds of each person's supply of bacon had been eaten?

O In California Jim Burns found 17 oz. of gold in 6 days. He was paid $1275 for it. How much was he paid for 1 oz. of the gold?

P In California it cost $1.50 to have one shirt washed and ironed. How much did Jim pay to have 7 shirts washed and ironed?

Q Eggs cost $10 a dozen. About how much did 1 egg cost?

Keeping skillful

A $6 \times 3209 = n$

$$\begin{array}{r} 3209 \\ \times\quad 6 \\ \hline 19254 \end{array}$$

The 19 means thousands because you multiplied 3000 by 6. Why is 19 written here and not 18?

B $27 \times \$18.70 = n$

$$\begin{array}{r} \$18.70 \\ \times\quad 27 \\ \hline 130\,90 \\ 374\,00 \\ \hline \$504.90 \end{array}$$

Why are a point and a dollar sign written in the answer?

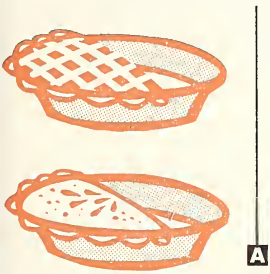
C $2 \times 4371 = n$
D $2665 \times 4 = n$
E $7 \times 1069 = n$
F $3978 \times 5 = n$
G $8 \times 5007 = n$
H $3 \times \$28.46 = n$
I $9 \times \$17.50 = n$
J $6 \times \$49.25 = n$
K $2 \times \$76.89 = n$
L $3 \times \$94.04 = n$

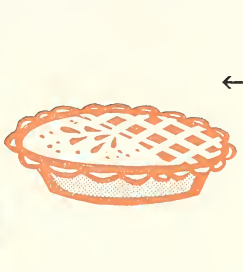
M $38 \times 2009 = n$
N $54 \times 4133 = n$
O $7206 \times 62 = n$
P $41 \times 5769 = n$
Q $4480 \times 23 = n$
R $16 \times \$14.35 = n$
S $22 \times \$43.75 = n$
T $76 \times \$20.63 = n$
U $48 \times \$32.17 = n$
V $25 \times \$56.40 = n$

A $88 \times 261 = n$
B $n \times 73 = 32850$
C $9 \times n = 6228$
D $405 \times 577 = n$
E $6 \times n = \$22.02$
F $n \times 52 = 48776$
G $93 \times 229 = n$
H $n \times 8 = 1664$
I $46 \times n = 23322$
J $81 \times 775 = n$

Moving forward

In this lesson you will see that fractions of things can be combined or separated. You will also learn when it is possible to add or subtract fractions.





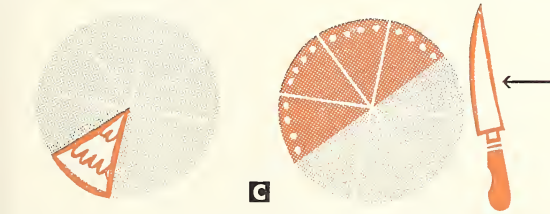
A

$\frac{1}{2}$ of one pie has been put with $\frac{1}{2}$ of another pie of the same size. Do you know what numeral to use to tell how much pie there is in all? Why or why not?

Picture A shows that $\frac{1}{2} + \frac{1}{2} = 1$.

B

$\frac{1}{8}$ of one cake has been put with $\frac{1}{2}$ of another cake of the same size. Do you know what numeral to use to tell how much cake there is in all? Why or why not?

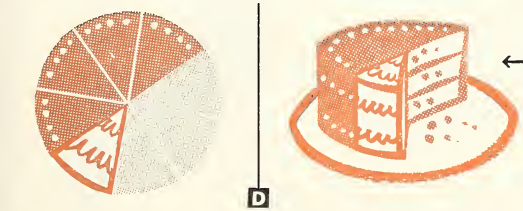


C

Picture C shows a way to find out how much cake there is in Picture B.

Imagine cutting the $\frac{1}{2}$ cake into equal parts, so that each equal part is $\frac{1}{8}$ of a whole cake.

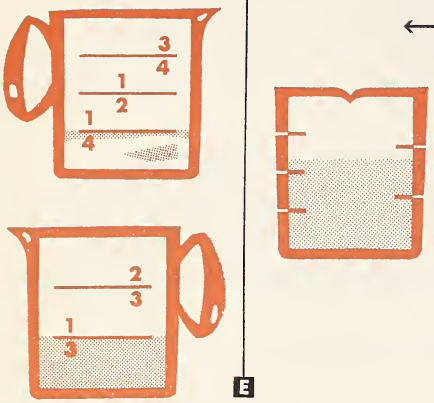
How many one eighths are there in $\frac{1}{2}$?



D

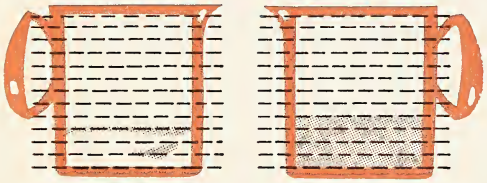
Picture D shows that you can use $\frac{5}{8}$ to tell how much cake there is in all.

The picture shows that $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$.



E

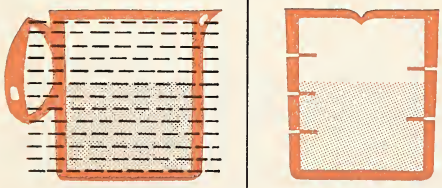
$\frac{1}{3}$ cup of juice has been combined with $\frac{1}{4}$ cup of water. Do you know what numeral to use to tell what fraction of a cup of liquid there is in all? Why or why not?



F

In Picture F you imagine that both cups have been marked to show twelfths. You think of twelfths because 12 can be divided by both ▦ and ▤.

How many one twelfths are there in $\frac{1}{4}$?
How many one twelfths are there in $\frac{1}{3}$?

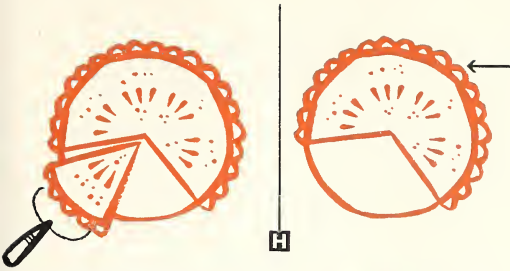


G

There is what fraction of a cup of liquid when the juice and water are combined?

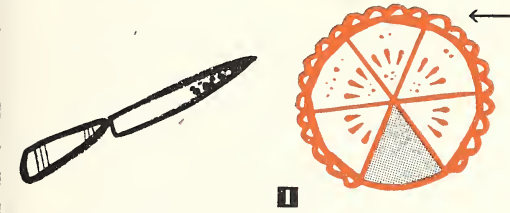
The pictures show that $\frac{1}{4}+\frac{1}{3}=\frac{7}{12}$.

If the cups had been marked in eighths, would you know how much liquid there is? Why or why not?



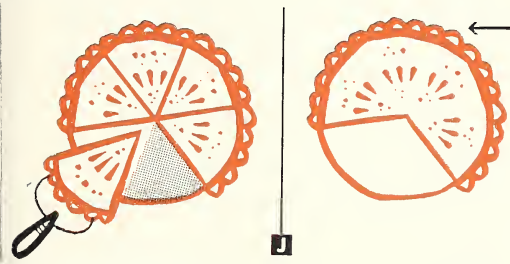
H

$\frac{1}{6}$ of a pie has been taken from $\frac{5}{6}$ of a pie. Can you tell what fraction of the pie is left? Why or why not?



I

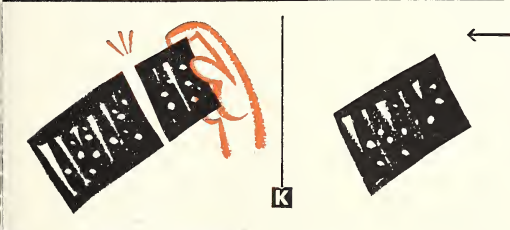
Imagine cutting the $\frac{5}{6}$ of a pie into equal parts, so that each equal part is $\frac{1}{6}$ of the whole pie. How many equal parts will there be?



J

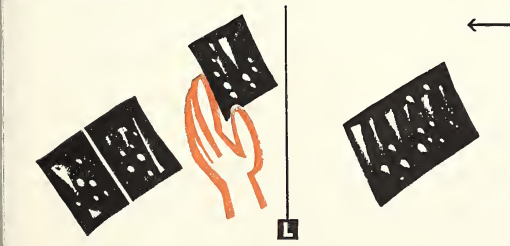
Now the picture shows that you can use $\frac{4}{6}$ to tell what fraction of the pie is left after $\frac{1}{6}$ is taken away.

The pictures show that $\frac{5}{6} - \frac{1}{6} = \frac{4}{6}$.



K

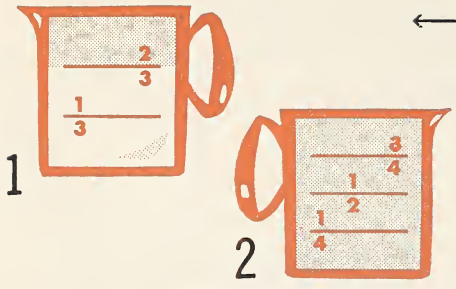
$\frac{1}{3}$ of a candy bar is broken off a whole candy bar. Can you tell what fraction of the bar is left?



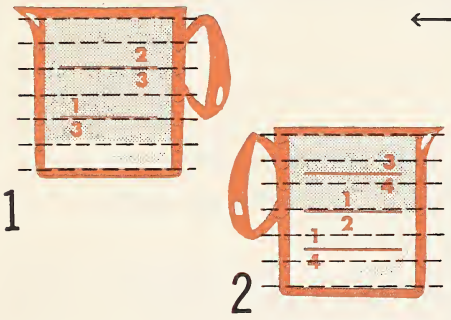
L

Think of the whole candy bar as marked off into 3 equal parts.
When $\frac{1}{3}$ is taken away, what fraction is left?

The pictures show that $1 - \frac{1}{3} = \frac{2}{3}$.



M Cup 1 contains $\frac{2}{3}$ cup of milk. Cup 2 is empty. If you pour $\frac{1}{2}$ cup of milk from Cup 1 into Cup 2, how much milk will be left in Cup 1?



Imagine that both cups have been marked to show sixths. You think of sixths because 6 can be divided by both ▒ and ▒.

N How many one sixths are there in $\frac{2}{3}$?
How many one sixths are there in $\frac{1}{2}$?

When you have poured 3 sixths of a cup into Cup 2, what fraction of a cup of milk is left in Cup 1?

The pictures show that $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$.

Now you see that you can add fractions or subtract one fraction from another. But first you must make sure that the fraction numerals have a common denominator. What denominator would you use in adding or subtracting the fractions in each of these exercises?

A $\frac{3}{4}, \frac{1}{2}$	**E** $\frac{5}{6}, \frac{2}{3}$	**I** $\frac{3}{5}, \frac{1}{2}$	**M** $\frac{1}{4}, \frac{1}{6}$	**Q** $\frac{5}{8}, \frac{3}{16}$	**U** $\frac{7}{8}, \frac{1}{3}$
B $\frac{9}{10}, \frac{1}{2}$	**F** $\frac{3}{4}, \frac{1}{3}$	**J** $\frac{11}{12}, \frac{2}{3}$	**N** $\frac{4}{5}, \frac{2}{3}$	**R** $\frac{7}{8}, \frac{1}{6}$	**V** $\frac{1}{4}, \frac{1}{5}$
C $\frac{1}{2}, \frac{1}{3}$	**G** $\frac{5}{12}, \frac{1}{4}$	**K** $\frac{9}{16}, \frac{1}{2}$	**O** $\frac{3}{4}, \frac{3}{8}$	**S** $\frac{2}{5}, \frac{1}{10}$	**W** $\frac{7}{10}, \frac{1}{3}$
D $\frac{9}{10}, \frac{3}{10}$	**H** $\frac{1}{2}, \frac{3}{8}$	**L** $\frac{7}{8}, \frac{5}{8}$	**P** $\frac{1}{6}, \frac{1}{12}$	**T** $\frac{5}{9}, \frac{1}{3}$	**X** $\frac{5}{6}, \frac{2}{5}$

Now you know that when you add or subtract fractions, the denominators must be alike. Often you will have to change the fraction numerals.

Keeping skillful

A To arrange $\frac{9}{16}$, $\frac{3}{4}$, and $\frac{3}{8}$ in the order of size, beginning with the smallest, you should first change them to fraction numerals with a common denominator. Can you write all of them as fourths? As eighths? As sixteenths?

B Change the three fraction numerals to sixteenths. Which fraction is the smallest? Which is next in size? Which is the largest?

C Arrange $\frac{5}{8}$, $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{7}{12}$ in the order of size. Begin with the largest. Should you use 8 as a common denominator? Should you use 3 or 6 or 12 as a common denominator? Since 12 is the largest of the four denominators, try 24 for the common denominator. Why?

Write the fraction numerals in each exercise below with a common denominator. Then write them in the order of size of the fractions. In each exercise begin with the smallest.

D $\frac{11}{12}, \frac{3}{4}, \frac{2}{3}$

E $\frac{4}{5}, \frac{3}{4}, \frac{1}{2}$

F $\frac{5}{6}, \frac{7}{12}, \frac{2}{3}$

G $\frac{7}{12}, \frac{5}{8}, \frac{3}{4}$

H $\frac{9}{10}, \frac{4}{5}, \frac{1}{2}$

I $\frac{3}{4}, \frac{3}{5}, \frac{7}{10}$

J $\frac{5}{6}, \frac{2}{3}, \frac{5}{8}, \frac{3}{4}$

K $\frac{2}{3}, \frac{5}{6}, \frac{9}{12}, \frac{3}{4}$

A 6 T. = ▒ lb.
B ▒ fl. oz. = 5 c.
C 104 wk. = ▒ yr.
D 4 yd. = ▒ in.
E 64 qt. = ▒ pk.
F 96 qt. = ▒ bu.
G ▒ pt. = 9 gal.
H 16 tbs. = ▒ fl. oz.
I ▒ hr. = 360 min.
J 2 yr. = ▒ da.
K ▒ bu. = 68 pk.
L 112 oz. = ▒ lb.
M ▒ yd. = 117 ft.
N 18 gal. = ▒ qt.
O ▒ min. = 420 sec.
P 32 wk. = ▒ da.
Q ▒ pt. = 15 qt.

A $29 \times 406 = n$
B $1512 \div n = 36$
C $n \times 16 = 144$
D $57 \times n = 456$
E $5435 \div 83 = n$
F $1683 \div n = 99$
G $n \times 36 = 2088$
H $2709 \div 64 = n$
I $38 \times 2119 = n$
J $85 \times n = 3060$
K $814 \div n = 74$
L $184 \times 306 = n$
M $1764 \div 18 = n$
N $n \times 25 = 1725$
O $24591 \div 81 = n$
P $15 \times n = 1605$
Q $3024 \div n = 48$

A $3684 + 9267 = n$
B $7000 - n = 4621$
C $n + 625 = 7023$
D $n - 1536 = 6410$
E $831 - 426 = n$
F $n + 32090 = 65111$
G $689 + n = 1283$
H $n - 402 = 534$
I $74230 - 51107 = n$
J $2975 + 3036 = n$
K $9462 - n = 8003$
L $2274 + n = 3040$
M $68472 - 21395 = n$
N $n + 7916 = 14282$
O $n - 5006 = 1694$
P $777 + n = 2020$
Q $1100 - n = 909$

Thinking straight

A The pictures above will help you decide whether certain fractions are larger or smaller than other fractions. Start with Picture A. As you go from picture to picture, does the red part of each become smaller or larger? Does the white part become smaller or larger?

B How do Pictures B and F show that $\frac{1}{3}$ is larger than $\frac{1}{7}$?

C Is $\frac{1}{5}$ larger or smaller than $\frac{1}{7}$? Is $\frac{1}{6}$ larger or smaller than $\frac{1}{4}$?

D How do Pictures B and F also show that $\frac{2}{3}$ is smaller than $\frac{6}{7}$?

E Is $\frac{6}{7}$ larger or smaller than $\frac{3}{4}$? Is $\frac{2}{3}$ larger or smaller than $\frac{5}{6}$?

F Sometimes two fractions are so different in size that you can tell which is larger just by looking at the fraction numerals. For example, to decide which is larger, $\frac{6}{7}$ or $\frac{1}{3}$, you should not have to change the denominators. Why?

G Suppose you wanted to compare $\frac{4}{5}$ with $\frac{5}{4}$. Which fraction is more than 1? Which fraction is less than 1? Which fraction is the smaller?

H Which is larger, $\frac{2}{3}$ or $\frac{3}{2}$? Which is smaller, $\frac{5}{6}$ or $\frac{6}{5}$?

For each pair of fractions below, try to decide which is the smaller. Do not change the denominators.

A	$\frac{1}{5}, \frac{1}{2}$	**E**	$\frac{1}{3}, \frac{5}{6}$	**I**	$\frac{1}{4}, \frac{7}{9}$	**M**	$\frac{1}{2}, \frac{1}{3}$
B	$\frac{1}{3}, \frac{1}{7}$	**F**	$\frac{7}{6}, \frac{6}{7}$	**J**	$\frac{8}{9}, \frac{9}{8}$	**N**	$\frac{3}{4}, \frac{4}{5}$
C	$\frac{3}{4}, \frac{4}{3}$	**G**	$\frac{11}{12}, \frac{1}{4}$	**K**	$\frac{1}{4}, \frac{1}{8}$	**O**	$\frac{6}{7}, \frac{1}{2}$
D	$\frac{2}{3}, \frac{1}{4}$	**H**	$\frac{5}{7}, \frac{7}{5}$	**L**	$\frac{11}{12}, \frac{12}{11}$	**P**	$\frac{2}{3}, \frac{3}{4}$

For each pair of fractions below, decide which is the larger. Try first to decide without changing the denominators. If you cannot decide, change the denominators.

A	$\frac{2}{5}, \frac{7}{10}$	**E**	$\frac{3}{4}, \frac{11}{20}$	**I**	$\frac{7}{8}, \frac{11}{16}$	**M**	$\frac{4}{15}, \frac{1}{5}$
B	$\frac{1}{4}, \frac{5}{6}$	**F**	$\frac{5}{8}, \frac{5}{6}$	**J**	$\frac{1}{3}, \frac{4}{9}$	**N**	$\frac{7}{8}, \frac{8}{7}$
C	$\frac{11}{12}, \frac{5}{6}$	**G**	$\frac{3}{16}, \frac{1}{8}$	**K**	$\frac{7}{12}, \frac{3}{4}$	**O**	$\frac{4}{5}, \frac{5}{6}$
D	$\frac{5}{16}, \frac{3}{4}$	**H**	$\frac{15}{16}, \frac{16}{15}$	**L**	$\frac{9}{10}, \frac{11}{12}$	**P**	$\frac{1}{5}, \frac{2}{3}$

Learning how

In this lesson you will learn how to add fractions.

see

A

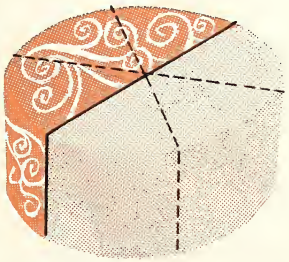
Mrs. Page gave $\frac{1}{2}$ of a cake to one friend and $\frac{1}{3}$ of the same cake to another friend. How much of the cake did she give to these two friends?

$\frac{1}{2} + \frac{1}{3} = n$ You must find this number.

B

Put $\frac{1}{3}$ of the cake with $\frac{1}{2}$ of the cake. You do not know what fraction of a whole cake she gave away.

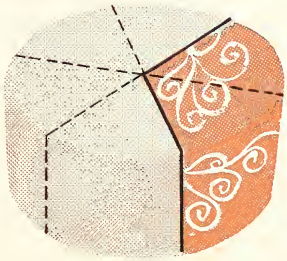
You will add $\frac{1}{3}$ to $\frac{1}{2}$. You must change the fraction numerals before you add.



C

Imagine cutting each of the fractions of the cake into equal pieces so that each piece is one sixth of the whole cake.

Then the $\frac{1}{2}$ of the cake would be cut into 3 pieces, or 3 sixths of the whole cake. The $\frac{1}{3}$ of the cake would be cut into 2 pieces, or 2 sixths of the whole cake.



Before you add $\frac{1}{3}$ to $\frac{1}{2}$, find a common denominator. 6 is the smallest common denominator.

$\frac{1}{2} = \frac{3}{6}$ $\frac{1}{3} = \frac{2}{6}$

$\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6}$

Now turn the page.

Now put the 2 sixths of the cake with the 3 sixths. There are 5 sixths.

D

Add the numerators to find how many sixths there are in all. There are 5 sixths.

$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

Write 5 as the numerator of the answer. You are adding sixths. So write 6 as the denominator.

Mrs. Page gave $\frac{5}{6}$ of a cake to her friends.
$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

---

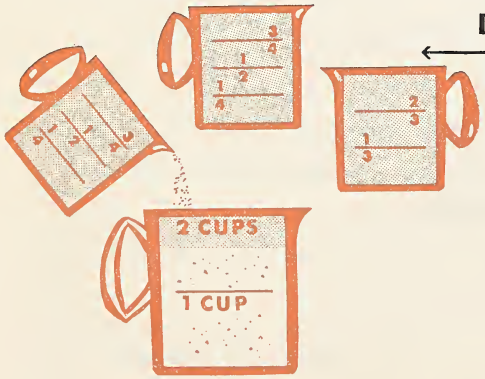
see

A

Mrs. Page used $\frac{3}{4}$ cup of sugar for a pie, $\frac{1}{3}$ cup of sugar for cookies, and $\frac{1}{2}$ cup of sugar for coffee cake. She used how much sugar in all?

$\frac{3}{4} + \frac{1}{3} + \frac{1}{2} = n$

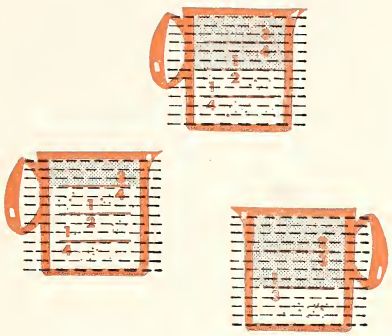
You must find this number.



B

Put $\frac{3}{4}$ cup of sugar, $\frac{1}{3}$ cup of sugar, and $\frac{1}{2}$ cup of sugar into a larger measuring glass. You do not know what numeral to use to tell how much sugar she used.

You will add $\frac{3}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$. You must change the fraction numerals before you add.



Picture C shows that you can think of the measuring cups as marked to show twelfths.

C

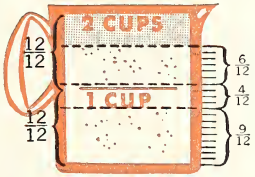
Now you can think of the $\frac{3}{4}$ cup of sugar as $\frac{9}{12}$ cup. You can think of the $\frac{1}{3}$ cup as $\frac{4}{12}$ cup and of the $\frac{1}{2}$ cup as $\frac{6}{12}$ cup.

Before you add $\frac{3}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$, find a common denominator. 12 is the smallest common denominator.

$\frac{3}{4}=\frac{\square}{12}$ $\frac{1}{3}=\frac{\square}{12}$ $\frac{1}{2}=\frac{\square}{12}$

$\frac{3}{4}+\frac{1}{3}+\frac{1}{2}=\frac{9}{12}+\frac{4}{12}+\frac{6}{12}$

D



Put $\frac{9}{12}$ cup, $\frac{4}{12}$ cup, and $\frac{6}{12}$ cup together.

Add the numerators. There are 19 twelfths.

$\frac{9}{12}+\frac{4}{12}+\frac{6}{12}=\frac{19}{12}$ ← Write 19 as the numerator of the answer. You are adding twelfths. Write 12 as the denominator.

E

Mrs. Page used $\frac{19}{12}$ cups of sugar. She used more than one whole cup.

Mrs. Page used 1 whole cup and $\frac{7}{12}$ of another cup of sugar.

$\frac{19}{12}=1\frac{7}{12}$

Mrs. Page used $1\frac{7}{12}$ cups of sugar.

$\frac{3}{4}+\frac{1}{3}+\frac{1}{2}=1\frac{7}{12}$

think

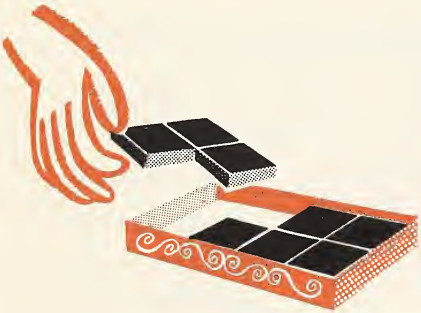
A

When Mary was cleaning a cupboard, she found one package with $\frac{3}{8}$ of a bar of chocolate in it. She found another package with $\frac{5}{8}$ of a bar in it. She said, "Altogether we have as much chocolate as there is in one whole bar." Was she right?

$\frac{5}{8} + \frac{3}{8} = n$ ← You must find this number.

← Put the $\frac{3}{8}$ of a bar with the $\frac{\square}{8}$ of a bar.

B



To add $\frac{3}{8}$ to $\frac{5}{8}$, do you have to change the denominators? Why?

What do you do with the numerators?

$\frac{5}{8} + \frac{3}{8} = \frac{8}{8}$

Why is 8 written in the numerator? Why is 8 also written in the denominator?

C

← Mary had $\frac{8}{8}$ of a bar of chocolate.

Did she have as much chocolate as there is in one whole bar?

$\frac{8}{8} = 1$

Was Mary right?

$\frac{5}{8} + \frac{3}{8} = 1$

try

A $\frac{1}{2}+\frac{4}{5}=n$

Use 10 for the denominator when you add. Why?

$\frac{5}{10}+\frac{8}{10}=n$

$\frac{5}{10}+\frac{8}{10}=\frac{13}{10}$ or $1\frac{3}{10}$

How do you get the 13 in $\frac{13}{10}$?
How do you get $1\frac{3}{10}$?

Here is another way you can write $\frac{1}{2}$ and $\frac{4}{5}$ when you add.

$\frac{1}{2}=\frac{5}{10}$
$\frac{4}{5}=\frac{8}{10}$
$\frac{13}{10}$ or $1\frac{3}{10}$

You may show your work in the way you like better.

B $\frac{1}{8}+\frac{3}{4}=n$

What common denominator do you use?
Why do you not change $\frac{1}{8}$?

$\frac{1}{8}+\frac{6}{8}=n$

$\frac{1}{8}+\frac{6}{8}=\frac{7}{8}$

Is the answer in simplest form?

Here is another way you can write $\frac{1}{8}$ and $\frac{3}{4}$ when you add.

$\frac{1}{8}=\frac{1}{8}$
$\frac{3}{4}=\frac{6}{8}$
$\frac{7}{8}$

C $\frac{9}{10}+\frac{7}{10}=n$

Why do you not change the fraction numerals?

$\frac{9}{10}+\frac{7}{10}=\frac{16}{10}$ or $1\frac{6}{10}$ or $1\frac{3}{5}$

How do you know that $1\frac{3}{5}$ is the simplest form for $\frac{16}{10}$?

You can also write your work for Example C in this way.

$\frac{9}{10}$
$\frac{7}{10}$
$\frac{16}{10}$ or $1\frac{6}{10}$ or $1\frac{3}{5}$

D $\frac{1}{4}+\frac{7}{12}=n$

What common denominator do you use?
Why do you not change $\frac{7}{12}$?

$\frac{3}{12}+\frac{7}{12}=n$

$\frac{3}{12}+\frac{7}{12}=\frac{10}{12}$ or $\frac{5}{6}$

How do you know that $\frac{5}{6}$ is the simplest form for $\frac{10}{12}$?

You can also write your work for Example D in this way.

$\frac{1}{4}=\frac{3}{12}$
$\frac{7}{12}=\frac{7}{12}$
$\frac{10}{12}$ or $\frac{5}{6}$

E $\frac{3}{8}+\frac{15}{16}+\frac{11}{16}=n$

What common denominator do you use?

$\frac{6}{16}+\frac{15}{16}+\frac{11}{16}=n$

$\frac{6}{16}+\frac{15}{16}+\frac{11}{16}=\frac{32}{16}$ or 2

How do you get the 32 in $\frac{32}{16}$? How do you know that 2 is another way to write $\frac{32}{16}$?

$\frac{3}{8}=\frac{6}{16}$
$\frac{15}{16}=\frac{15}{16}$
$\frac{11}{16}=\frac{11}{16}$
$\frac{32}{16}$ or 2

F $\frac{7}{8}+\frac{1}{3}+\frac{11}{12}=n$

Why do you not use 12 for the common denominator?

$\frac{21}{24}+\frac{8}{24}+\frac{22}{24}=n$

$\frac{21}{24}+\frac{8}{24}+\frac{22}{24}=\frac{51}{24}$ or $2\frac{3}{24}$ or $2\frac{1}{8}$

$\frac{7}{8}=\frac{21}{24}$
$\frac{1}{3}=\frac{8}{24}$
$\frac{11}{12}=\frac{22}{24}$
$\frac{51}{24}$ or $2\frac{3}{24}$ or $2\frac{1}{8}$

---

do

A A cooky recipe calls for $\frac{3}{4}$ cup of brown sugar and $\frac{3}{4}$ cup of white sugar. How much sugar in all does this recipe call for?

$\frac{3}{4}+\frac{3}{4}=n$

B Mrs. Fisher used $\frac{1}{4}$ cup of lemon juice and $\frac{2}{3}$ cup of orange juice to make an orange cream pie. How much juice in all did she use for the pie?

$\frac{1}{4}+\frac{2}{3}=n$

Show your answers in simplest form.

C $\frac{1}{3}+\frac{1}{3}=n$
D $\frac{7}{8}+\frac{1}{8}=n$
E $\frac{3}{16}+\frac{3}{8}+\frac{1}{2}=n$
F $\frac{9}{10}+\frac{3}{10}=n$
G $\frac{1}{4}+\frac{1}{2}+\frac{3}{4}=n$
H $\frac{2}{3}+\frac{1}{6}=n$

I $\frac{5}{8}+\frac{1}{4}=n$
J $\frac{3}{10}+\frac{1}{5}+\frac{1}{2}=n$
K $\frac{11}{12}+\frac{2}{3}+\frac{5}{6}=n$
L $\frac{1}{6}+\frac{1}{12}=n$
M $\frac{2}{3}+\frac{4}{5}=n$
N $\frac{1}{6}+\frac{1}{8}=n$

A $\frac{3}{8}+\frac{1}{6}=n$
B $\frac{7}{12}+\frac{1}{12}=n$
C $\frac{1}{5}+\frac{3}{4}=n$
D $\frac{2}{3}+\frac{1}{3}+\frac{3}{5}=n$
E $\frac{7}{8}+\frac{5}{6}=n$
F $\frac{11}{16}+\frac{3}{4}+\frac{7}{8}=n$

G $\frac{5}{6}+\frac{1}{2}=n$
H $\frac{3}{4}+\frac{1}{10}=n$
I $\frac{5}{6}+\frac{1}{2}+\frac{3}{8}=n$
J $\frac{1}{2}+\frac{3}{4}=n$
K $\frac{1}{4}+\frac{1}{6}+\frac{2}{3}=n$
L $\frac{15}{16}+\frac{7}{8}+\frac{3}{4}=n$

Now you should know how to add fractions and give the answers in different forms.

Learning how

Now you will learn how to add mixed numbers and fractions.

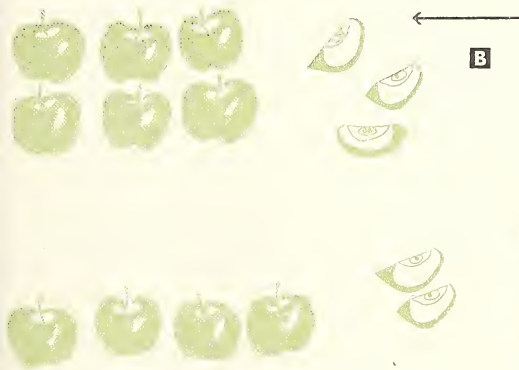
see

A

Mrs. Cook used $6\frac{3}{4}$ apples for one pie and $4\frac{1}{2}$ apples for a smaller pie. How many apples did she use for both pies?

$6\frac{3}{4} + 4\frac{1}{2} = n$

You must find this number.



B

Before you put the $\frac{1}{2}$ of an apple with the $\frac{3}{4}$ of an apple, think of the $\frac{1}{2}$ of an apple as $\frac{2}{4}$ of an apple.

First you will add $\frac{1}{2}$ to $\frac{3}{4}$.

Before you add, change the fraction numerals so that they will have a common denominator.

$6\frac{3}{4} = 6\frac{3}{4}$

$4\frac{1}{2} = 4\frac{2}{4}$

C

Now put the $\frac{2}{4}$ apple with the $\frac{3}{4}$ apple. There are $\frac{5}{4}$ apples.

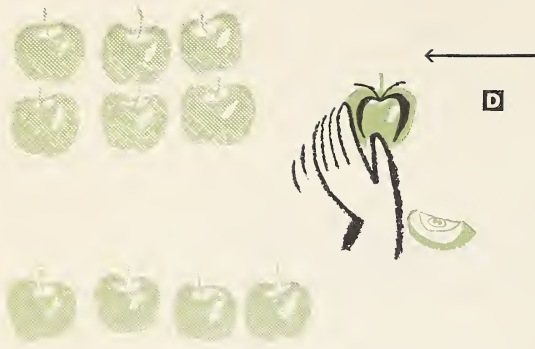
The sum of $\frac{3}{4}$ and $\frac{2}{4}$ is $\frac{5}{4}$.

$6\frac{3}{4} = 6\frac{3}{4}$

$4\frac{1}{2} = 4\frac{2}{4}$

$\frac{5}{4}$ apples are more than 1 apple.

Now turn the page.



D

Think of the fourths as put together to make as many whole apples as possible. There is 1 whole new apple. $\frac{1}{4}$ apple is left over.

Change the sum $\frac{5}{4}$ to $1\frac{1}{4}$.

$$\begin{array}{r} 6\frac{3}{4} = 6\frac{3}{4} \\ +\ 4\frac{1}{2} = 4\frac{2}{4} \\ \hline \\ \frac{1}{4} \end{array}$$

Write $\frac{1}{4}$ here.

E

Think of the new apple as being put with the other whole apples.

$$\begin{array}{r} {\scriptstyle 1} \\ 6\frac{3}{4} = 6\frac{3}{4} \\ +\ 4\frac{1}{2} = 4\frac{2}{4} \\ \hline \\ \frac{1}{4} \end{array}$$

Write 1 in the ones' column to show that there is 1 more whole.

F

Put the whole apples together. There are 11 whole apples.

Add the ones. The sum is 11.

$$\begin{array}{r} {\scriptstyle 1} \\ 6\frac{3}{4} = 6\frac{3}{4} \\ +\ 4\frac{1}{2} = 4\frac{2}{4} \\ \hline 11\frac{1}{4} \end{array}$$

Write 11 here.

G

Mrs. Cook used $11\frac{1}{4}$ apples for the two pies.

$6\frac{3}{4} + 4\frac{1}{2} = 11\frac{1}{4}$

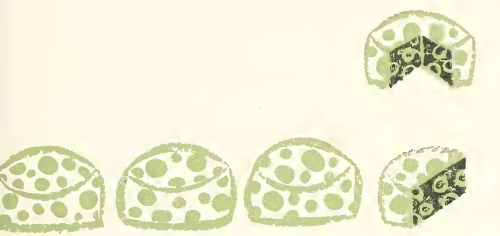
think

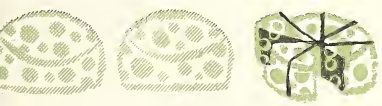
A

In his store Mr. Parker had some cheese in 1-pound packages. One day he sold $2\frac{7}{8}$ lb. The next day he sold $\frac{3}{4}$ lb. The third day he sold $3\frac{1}{2}$ lb. How many pounds of cheese did he sell in the three days?

$$2\tfrac{7}{8} + \tfrac{3}{4} + 3\tfrac{1}{2} = n$$

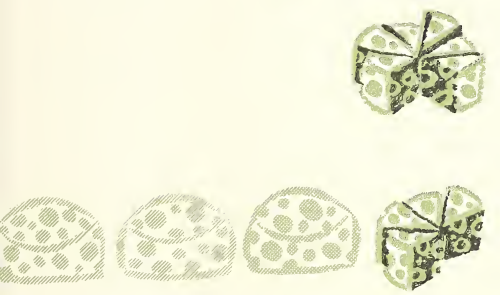
You must find this number.





B

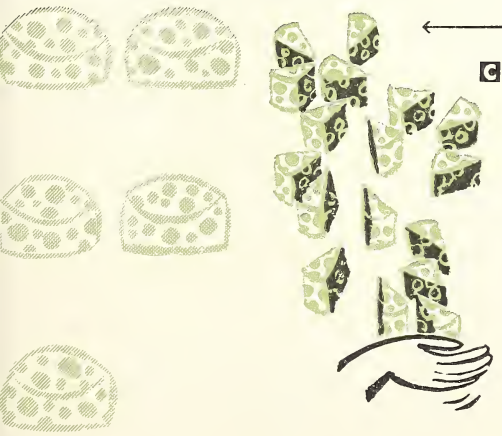
What will you put together first? Think of $\frac{3}{4}$ lb. as $\frac{\square}{8}$ lb. and $\frac{1}{2}$ lb. as $\frac{\square}{8}$ lb. Why do you think of eighths?



What will you add first?

Why do you change the fraction numerals to eighths?

$$2\tfrac{7}{8} = 2\tfrac{7}{8}$$
$$\tfrac{3}{4} = \tfrac{6}{8}$$
$$3\tfrac{1}{2} = 3\tfrac{4}{8}$$



C

Now what do you put together? There are how many eighths?

The sum of the fractions is $\frac{\square}{8}$.

$$2\tfrac{7}{8} = 2\tfrac{7}{8}$$
$$\tfrac{3}{4} = \tfrac{6}{8}$$
$$3\tfrac{1}{2} = 3\tfrac{4}{8}$$

$\frac{17}{8}$ pounds are more than 1 pound.

Now turn the page.

D

There are ▒ new whole pounds. $\frac{▒}{8}$ of a pound is left over.

Change the sum $\frac{17}{8}$ to ▒ $\frac{1}{8}$.

$$2\frac{7}{8} = 2\frac{7}{8}$$
$$\frac{3}{4} = \frac{6}{8}$$
$$3\frac{1}{2} = 3\frac{4}{8}$$
$$\frac{1}{8}$$

Why is $\frac{1}{8}$ written here?

E

Put the ▒ new pounds with the other whole pounds.

Why is 2 written here?

$$2\frac{7}{8} = 2\frac{7}{8}$$
$$\frac{3}{4} = \frac{6}{8}$$
$$3\frac{1}{2} = 3\frac{4}{8}$$
$$\frac{1}{8}$$

F

Now what do you put together?

There are ▒ whole pounds.

What do you add now?

The sum is ▒.

$$2\frac{7}{8} = 2\frac{7}{8}$$
$$\frac{3}{4} = \frac{6}{8}$$
$$3\frac{1}{2} = 3\frac{4}{8}$$
$$7\frac{1}{8}$$

Why do you write 7 here?

G How much cheese in all did Mr. Parker sell?

$2\frac{7}{8} + \frac{3}{4} + 3\frac{1}{2} = n$

try

A Mrs. Fisher bought $2\frac{2}{3}$ yd. of cloth to make a dress for Jane, $2\frac{5}{8}$ yd. to make a dress for Kathy, and $\frac{3}{4}$ yd. to make an apron for herself. She bought how much cloth in all?

$2\frac{2}{3} + 2\frac{5}{8} + \frac{3}{4} = n$

$2\frac{2}{3} = 2\frac{16}{24}$

$2\frac{5}{8} = 2\frac{15}{24}$

$\frac{3}{4} = \frac{18}{24}$

$6\frac{1}{24}$

Either remember this 2 or write it.

B $5\frac{1}{4} + 8\frac{7}{16} = n$

$5\frac{1}{4} = 5\frac{4}{16}$

$8\frac{7}{16} = 8\frac{7}{16}$

$13\frac{11}{16}$

C $2\frac{3}{8} + 6\frac{2}{3} = n$

$2\frac{3}{8} = 2\frac{9}{24}$

$6\frac{2}{3} = 6\frac{16}{24}$

$9\frac{1}{24}$

Why do you write 9 here instead of 8?

D $1\frac{11}{12} + 3\frac{3}{4} = n$

$1\frac{11}{12} = 1\frac{11}{12}$

$3\frac{3}{4} = 3\frac{9}{12}$

$5\frac{1}{12}$ or $5\frac{3}{4}$

E $7\frac{9}{10} + \frac{4}{5} + 1\frac{17}{20} = n$

$7\frac{9}{10} = 7\frac{18}{20}$

$\frac{4}{5} = \frac{16}{20}$

$1\frac{17}{20} = 1\frac{17}{20}$

$10\frac{11}{20}$

F $8\frac{1}{4} + \frac{5}{6} + 5\frac{11}{12} = n$

$8\frac{1}{4} = 8\frac{3}{12}$

$\frac{5}{6} = \frac{10}{12}$

$5\frac{11}{12} = 5\frac{11}{12}$

15

Why is there no fraction numeral in the answer?

G $12\frac{1}{8} + 7\frac{5}{8} = n$

$12\frac{1}{8}$

$7\frac{5}{8}$

$19\frac{6}{8}$ or $19\frac{3}{4}$

do

A When Andy made sails for his model sailboat, he used a piece of cloth $1\frac{1}{4}$ yd. long and another piece $\frac{5}{8}$ yd. long. How many yards of cloth did he use for the sails?

$1\frac{1}{4}+\frac{5}{8}=n$

B Mrs. Fisher used $3\frac{1}{2}$ cups of milk to make tomato soup, $\frac{2}{3}$ cup of milk to make a cake, and $\frac{3}{4}$ cup of milk to make bread. How many cups of milk did she use in all?

$3\frac{1}{2}+\frac{2}{3}+\frac{3}{4}=n$

C $4\frac{1}{10}+6\frac{1}{10}=n$	**K** $10\frac{7}{12}+28\frac{11}{12}=n$	**S** $8\frac{2}{5}+3\frac{2}{5}+\frac{4}{5}=n$	**A** $9\frac{1}{4}+\frac{13}{16}=n$
D $6\frac{2}{3}+\frac{1}{4}=n$	**L** $32\frac{1}{6}+17\frac{1}{8}=n$	**T** $6\frac{1}{10}+12\frac{4}{5}+\frac{7}{10}=n$	**B** $3\frac{5}{6}+11\frac{5}{6}=n$
E $3\frac{9}{16}+2\frac{1}{8}=n$	**M** $11\frac{7}{8}+21\frac{3}{4}=n$	**U** $4\frac{1}{6}+3\frac{5}{12}+\frac{1}{4}=n$	**C** $22\frac{3}{8}+5\frac{2}{3}=n$
F $1\frac{1}{2}+3\frac{1}{10}=n$	**N** $13\frac{1}{2}+8\frac{5}{6}=n$	**V** $10\frac{1}{4}+15\frac{1}{2}+\frac{2}{3}=n$	**D** $18\frac{1}{4}+13\frac{1}{4}=n$
G $1\frac{5}{6}+4\frac{3}{4}=n$	**O** $15\frac{3}{4}+12\frac{1}{4}=n$	**W** $1\frac{3}{8}+2\frac{1}{2}+\frac{7}{8}=n$	**E** $6\frac{1}{3}+2\frac{3}{5}=n$
H $\frac{5}{9}+2\frac{1}{9}=n$	**P** $12\frac{3}{10}+7\frac{4}{5}=n$	**X** $\frac{3}{4}+5\frac{9}{10}+3\frac{1}{2}=n$	**F** $8\frac{7}{16}+\frac{5}{16}=n$
I $7\frac{3}{8}+2\frac{13}{16}=n$	**Q** $27\frac{1}{3}+43\frac{4}{5}=n$	**Y** $\frac{11}{16}+2\frac{5}{8}+7\frac{3}{4}=n$	**G** $30\frac{2}{5}+42\frac{3}{4}=n$
J $5\frac{2}{3}+9\frac{5}{6}=n$	**R** $\frac{5}{12}+4\frac{2}{3}=n$	**Z** $5\frac{1}{3}+\frac{11}{15}+6\frac{1}{3}=n$	**H** $12\frac{5}{6}+9\frac{7}{8}=n$

Now you should be able to add mixed numbers and fractions.

Keeping skillful

Find the sum.

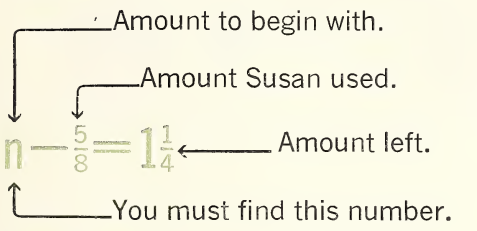
A	28, 37, 19, 42, 97
B	107, 3162, 843, 209
C	11029, 36475
D	623, 590, 1142
E	18, 6, 307, 422, 8
F	9684, 32000, 403
G	31, 58, 12, 22, 86
H	1047, 265, 3304
I	940, 801, 639, 723
J	4862, 3157, 218
K	44, 89, 7, 529, 600

A	$n \times 84 = 1092$
B	$558 \div 13 = n$
C	$43 \times n = 3741$
D	$703 \times 964 = n$
E	$1575 \div n = 25$
F	$96 \times n = 480$
G	$1463 \div 19 = n$
H	$62 \times n = 2976$
I	$n \times 54 = 1998$
J	$56 \times 785 = n$
K	$983 \div 82 = n$
L	$14 \times n = 1330$

A	$n + 1692 = 4837$
B	$10365 - 8427 = n$
C	$n - 762 = 1084$
D	$748 + n = 2134$
E	$6230 - n = 4118$
F	$2764 + 3398 = n$
G	$n - 4863 = 6122$
H	$n + 806 = 3254$
I	$606 - n = 119$
J	$1150 + n = 4317$
K	$87602 - 56849 = n$
L	$396 + 4834 = n$

Using arithmetic

A Susan's mother gave her a piece of cloth. Susan used $\frac{5}{8}$ of a yard to make an apron. Then she found that she had $1\frac{1}{4}$ yd. left. How much cloth had her mother given her?



Add $\frac{5}{8}$ to $1\frac{1}{4}$.

B One morning Jim rode $3\frac{9}{10}$ mi. on his bicycle. In the afternoon he rode $2\frac{1}{2}$ mi. How far did he ride that day?

C Nancy grew $1\frac{3}{4}$ in. during the first six months of the year. During the last six months she grew $1\frac{5}{8}$ in. How much did she grow in all that year?

D After a grocer had sold $10\frac{1}{2}$ lb. of fresh green beans, he had $26\frac{1}{2}$ lb. left. How many pounds of fresh green beans did he have to begin with?

E Sally bought a $3\frac{1}{4}$ lb. chicken and $\frac{1}{2}$ lb. of bacon. How many pounds of meat did she buy?

F Nancy's flower garden is in the shape of a triangle. Its sides measure $18\frac{1}{4}$ ft., $18\frac{1}{4}$ ft., and $19\frac{2}{3}$ ft. What is the perimeter of the garden?

G A story in a newspaper said that between 9 o'clock and 10 o'clock the temperature went down $2\frac{7}{10}°$. At 10 o'clock the temperature was $62\frac{3}{10}°$. What had the temperature been at 9 o'clock?

H It is $26\frac{4}{10}$ mi. from Hometown to Springton and $14\frac{6}{10}$ mi. from Springton to Sugar Hill. Mr. Price drove from Hometown to Sugar Hill by way of Springton. He drove how many miles?

I Bob helped his father plant the garden. He worked $\frac{3}{4}$ hr. on Monday, 1 hr. on Tuesday, and $1\frac{1}{2}$ hr. on Wednesday. How many hours did he work in all on these three days?

J Jane's mother made a dress for Jane to wear in a school play. She used 2 yd. of red cloth, $1\frac{3}{8}$ yd. of blue cloth, and $\frac{5}{8}$ yd. of white cloth. She used how many yards of cloth in all?

K Mrs. Green used $1\frac{1}{3}$ cups of sugar to make a cake and $\frac{7}{8}$ cup of sugar to make frosting. She used how many cups of sugar in all for the cake and the frosting?

L Ruth wrapped a present. She used $1\frac{3}{4}$ yd. of blue ribbon and $1\frac{2}{3}$ yd. of white ribbon to trim the package. She used how many yards in all?

M One morning when Jim had a cold, his temperature was $99\frac{4}{10}°$. At 4 o'clock in the afternoon his mother took his temperature and found that it had gone up $\frac{8}{10}°$. What was Jim's temperature at 4 o'clock?

N When Jim had a cold, he lost $1\frac{1}{2}$ lb. Then he weighed $62\frac{1}{4}$ lb. How much had Jim weighed before he had the cold?

O Mrs. Price used $4\frac{1}{2}$ c. of flour for bread. Then she found that she had $2\frac{1}{3}$ c. of flour left. How much flour did she have before she made the bread?

P Jim's baseball team practiced $\frac{1}{2}$ hr. on Thursday, $1\frac{1}{2}$ hr. on Friday, and $1\frac{3}{4}$ hr. on Saturday. How many hours did the team practice in all on these three days?

Thinking straight

A $\frac{2}{3}+\frac{3}{4}+\frac{1}{3}=n$

Look at these fractions. The sum of which two fractions is 1? Remember to add $\frac{3}{4}$ to 1.

B $\frac{1}{4}+\frac{1}{2}+\frac{3}{4}+\frac{1}{2}=n$

What is the sum of $\frac{1}{4}$ and $\frac{3}{4}$?

What is the sum of $\frac{1}{2}$ and $\frac{1}{2}$?

Why do you not need to use 4 as a common denominator?

C $\frac{1}{4}+\frac{2}{3}+\frac{1}{4}=n$

The sum of $\frac{1}{4}$ and $\frac{1}{4}$ is $\frac{2}{4}$, or $\frac{\square}{2}$.

Now add $\frac{2}{3}$ to $\frac{1}{2}$.

Is it easier to add this way than to change $\frac{1}{4}$, $\frac{2}{3}$, and $\frac{1}{4}$ to twelfths?

D $2\frac{1}{5}+7\frac{5}{6}+3\frac{4}{5}=n$

Add $\frac{1}{5}$ and $\frac{4}{5}$. The sum is $\square$. What is the sum of the whole numbers? Remember to add the 1 and the $\frac{5}{6}$.

E $4\frac{5}{12}+\frac{9}{10}+3\frac{7}{12}+\frac{1}{10}=n$

What is the sum of the twelfths? What is the sum of the tenths? How do you know that the answer is 9?

In each example below, try to add without changing the fraction numerals.

A $\frac{1}{4}+\frac{1}{3}+\frac{1}{4}+1\frac{2}{3}=n$

B $\frac{5}{16}+\frac{2}{5}+\frac{11}{16}+\frac{3}{5}=n$

C $\frac{3}{8}+\frac{2}{3}+\frac{1}{8}+1=n$

D $\frac{5}{12}+\frac{3}{4}+\frac{1}{12}=n$

E $\frac{3}{8}+\frac{4}{5}+\frac{1}{8}=n$

F $1\frac{1}{2}+5\frac{1}{6}+4\frac{1}{2}+\frac{5}{6}=n$

Moving forward

Sometimes you will need to change a mixed number to another form. Now you will learn how to do this.

A Look at Picture A. It shows ▭ disks of paper and $\frac{▭}{4}$ of another disk. Does the picture show $3\frac{1}{4}$?

B Now look at Picture B. Each disk has been cut into 4 equal pieces. There are ▭ fourths for each disk. In the 3 disks there are 3×4, or ▭ fourths. In the $3\frac{1}{4}$ disks there are 12 fourths + 1 fourth, or ▭ fourths. You can think of $3\frac{1}{4}$ as how many fourths? $3\frac{1}{4}$ equals what improper fraction?

$1 = \frac{4}{4}$ $\quad 3 = \frac{12}{4}$ $\quad 3\frac{1}{4} = \frac{13}{4}$

C Express $6\frac{3}{8}$ as an improper fraction.

$1 = \frac{8}{8}$ $\quad 6 = \frac{▭}{8}$ $\quad 6\frac{3}{8} = \frac{▭}{8}$

Express each mixed number below as an improper fraction.

D $4\frac{2}{3}$	**G** $1\frac{1}{8}$	**J** $2\frac{1}{2}$	**M** $5\frac{3}{4}$
E $5\frac{1}{4}$	**H** $7\frac{3}{10}$	**K** $3\frac{1}{3}$	**N** $4\frac{11}{12}$
F $2\frac{7}{8}$	**I** $2\frac{4}{5}$	**L** $5\frac{5}{6}$	**O** $6\frac{5}{8}$

P Look at Picture C. How many disks have been cut into fourths? How many disks have not been cut? Now there are 2 whole disks and ▭ fourths of disks. You can think of $3\frac{1}{4}$ as 2 and how many fourths?

$3\frac{1}{4} = 2\frac{5}{4}$

Q To change $3\frac{3}{5}$ to $2\frac{8}{5}$, you use 1 from the 3 and change the 1 to $\frac{▭}{5}$. Then what do you do to find the numerator of $\frac{8}{5}$? Why do you write 2 instead of 3 for the whole number?

In each exercise below, what is the missing numerator?

R $3\frac{1}{2} = 2\frac{▭}{2}$	**V** $5\frac{3}{8} = 4\frac{▭}{8}$
S $5\frac{2}{3} = 4\frac{▭}{3}$	**W** $2\frac{9}{10} = 1\frac{▭}{10}$
T $7\frac{1}{8} = 6\frac{▭}{8}$	**X** $7\frac{5}{16} = 6\frac{▭}{16}$
U $3\frac{5}{6} = 2\frac{▭}{6}$	**Y** $10\frac{7}{12} = 9\frac{▭}{12}$

Now you should be able to change mixed numbers when you need to.

Learning how

In this lesson you will learn how to subtract fractions.

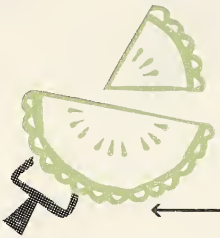
see

A

Mrs. Price has $\frac{2}{3}$ of an apple pie. She plans to use $\frac{1}{2}$ of the whole pie for lunch. What part of a pie will be left?

$\frac{2}{3} - \frac{1}{2} = n$

You must find this number.



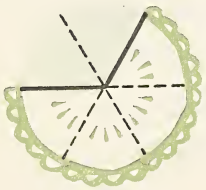
Take $\frac{1}{2}$ of a pie from $\frac{2}{3}$ of a pie.

You do not know what fraction of a whole pie will be left.

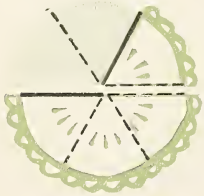
You will subtract $\frac{1}{2}$ from $\frac{2}{3}$. Change the fraction numerals before you subtract.

Think of the whole pie as divided into sixths. Then there will be 4 pieces, or 4 sixths, in the part Mrs. Price has.

B



There will be 3 pieces, or 3 sixths, in the part she plans to use for lunch.



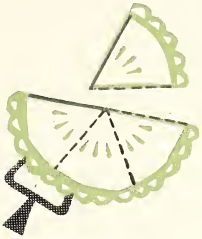
Before you subtract, you change the fraction numerals so that they will have a common denominator. 6 is the smallest common denominator.

$\frac{2}{3} = \frac{4}{6}$ $\frac{1}{2} = \frac{3}{6}$

$\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6}$

Take 3 sixths of the pie from the 4 sixths. One sixth will be left.

C



Subtract the numerators to find how many sixths are left. One sixth is left.

$\frac{4}{6} - \frac{3}{6} = \frac{1}{6}$

Write 1 as the numerator of the answer. You are subtracting sixths. So write 6 as the denominator.

Mrs. Price will have $\frac{1}{6}$ of a pie left.

$\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$

---

think

A

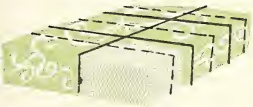
Mrs. White has $\frac{5}{6}$ of a cake. She plans to put $\frac{1}{4}$ of the whole cake in Tony's lunch box. How much of a whole cake will she have left?

$\frac{5}{6} - \frac{1}{4} = n$

You must find this number.

What must you do with the fraction numerals before you subtract?

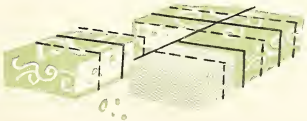
Why do you think of the whole cake as divided into twelfths? How many twelfths are there in the part that Mrs. White has?



In the part she is going to put in Tony's lunch box there are ▒ twelfths.

B

Why can you use 12 as the common denominator when you subtract?



$\frac{5}{6} = \frac{10}{\square}$ $\frac{1}{4} = \frac{3}{\square}$ $\frac{5}{6} - \frac{1}{4} = \frac{\square}{12} - \frac{\square}{12}$

Now turn the page.

C

Take ▒ twelfths of the cake away from the ▒ twelfths. ▒ twelfths will be left.

$\frac{10}{12} - \frac{3}{12} = \frac{\square}{12}$

What do you do with the numerators?

What do you write as the numerator of the answer? Why do you write 12 as the denominator?

Mrs. White will have $\frac{\square}{12}$ of a whole cake left.

$\frac{5}{6} - \frac{1}{4} = \frac{\square}{12}$

---

try

A $\frac{7}{8} - \frac{1}{3} = n$

Use 24 for the denominator when you subtract. Why?

$\frac{21}{24} - \frac{8}{24} = n$

$\frac{21}{24} - \frac{8}{24} = \frac{13}{24}$

You may write your work this way if you want to.

$\frac{7}{8} = \frac{21}{24}$

$\frac{1}{3} = \frac{8}{24}$

$\frac{13}{24}$

B $\frac{11}{15} - \frac{2}{15} = n$

Why do you not change the fraction numerals?

$\frac{11}{15} - \frac{2}{15} = \frac{9}{15}$ or $\frac{3}{5}$

How do you know that $\frac{3}{5}$ is the simplest form for $\frac{9}{15}$?

Your work may be written this way.

$\frac{11}{15}$

$\frac{2}{15}$

$\frac{9}{15}$ or $\frac{3}{5}$

C $\frac{5}{6} - \frac{3}{4} = n$

What common denominator do you use?

$\frac{10}{12} - \frac{9}{12} = n$

$\frac{10}{12} - \frac{9}{12} = \frac{1}{12}$

You may write your work in this way.

$\frac{5}{6} = \frac{10}{12}$

$\frac{3}{4} = \frac{9}{12}$

$\frac{1}{12}$

D $\frac{11}{12}-\frac{1}{6}=n$

What common denominator do you use?
Why do you not change $\frac{11}{12}$?

$\frac{11}{12}-\frac{2}{12}=n$

$\frac{11}{12}-\frac{2}{12}=\frac{9}{12}$ or $\frac{3}{4}$

Your work may be written this way.

$\frac{11}{12}=\frac{11}{12}$

$\frac{1}{6}=\frac{2}{12}$

$\frac{9}{12}$ or $\frac{3}{4}$

do

A Jim bought $\frac{3}{4}$ lb. of peanuts. He took $\frac{1}{2}$ lb. to the park to feed the squirrels. He had what fraction of a pound of peanuts left?
$\frac{3}{4}-\frac{1}{2}=n$

B Susan had $\frac{7}{8}$ yd. of blue cloth. She used $\frac{3}{8}$ yd. to make a dress for her doll. How much blue cloth did Susan have left?
$\frac{7}{8}-\frac{3}{8}=n$

Show your answers in simplest form.

C $\frac{11}{12}-\frac{1}{2}=n$	I $\frac{4}{5}-\frac{2}{3}=n$	O $\frac{7}{16}-\frac{1}{16}=n$	A $\frac{9}{16}-\frac{1}{4}=n$	G $\frac{7}{10}-\frac{2}{5}=n$
D $\frac{5}{8}-\frac{1}{4}=n$	J $\frac{7}{12}-\frac{1}{4}=n$	P $\frac{3}{4}-\frac{1}{5}=n$	B $\frac{7}{12}-\frac{1}{6}=n$	H $\frac{11}{16}-\frac{3}{8}=n$
E $\frac{9}{10}-\frac{3}{4}=n$	K $\frac{3}{4}-\frac{1}{3}=n$	Q $\frac{7}{10}-\frac{3}{10}=n$	C $\frac{5}{8}-\frac{1}{3}=n$	I $\frac{7}{8}-\frac{5}{6}=n$
F $\frac{5}{6}-\frac{1}{3}=n$	L $\frac{7}{8}-\frac{1}{2}=n$	R $\frac{9}{10}-\frac{3}{4}=n$	D $\frac{9}{10}-\frac{1}{4}=n$	J $\frac{3}{5}-\frac{1}{4}=n$
G $\frac{5}{6}-\frac{3}{8}=n$	M $\frac{15}{16}-\frac{3}{8}=n$	S $\frac{5}{6}-\frac{4}{5}=n$	E $\frac{2}{3}-\frac{1}{4}=n$	K $\frac{9}{16}-\frac{3}{8}=n$
H $\frac{1}{2}-\frac{1}{4}=n$	N $\frac{2}{3}-\frac{1}{8}=n$	T $\frac{2}{3}-\frac{3}{10}=n$	F $\frac{3}{4}-\frac{2}{3}=n$	L $\frac{11}{12}-\frac{1}{4}=n$

Now you should be able to subtract one fraction from another.

Keeping skillful

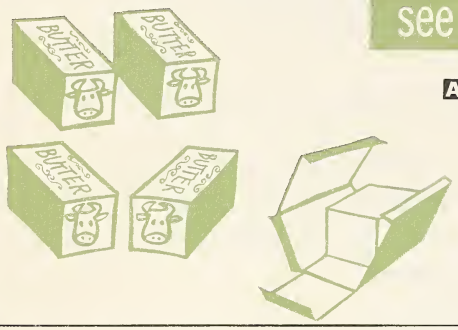
A $\frac{3}{5}+\frac{2}{3}+1\frac{1}{5}=n$	A $n-4\frac{1}{2}=6\frac{3}{4}$	H $8\frac{11}{12}+5\frac{11}{12}=n$	A $1006-837=n$
B $2\frac{7}{8}+5\frac{1}{6}=n$	B $11\frac{5}{6}+4\frac{2}{3}=n$	I $n-\frac{1}{3}=\frac{7}{10}$	B $n+795=2863$
C $\frac{1}{4}+\frac{1}{2}+\frac{5}{6}=n$	C $n-1\frac{1}{5}=2\frac{3}{4}$	J $4\frac{1}{2}+2\frac{3}{5}=n$	C $54+82+96=n$
D $8\frac{1}{5}+7\frac{2}{5}=n$	D $\frac{11}{12}+\frac{1}{6}+\frac{1}{2}=n$	K $\frac{7}{8}+1\frac{5}{6}=n$	D $7816-n=5437$
E $\frac{3}{10}+\frac{4}{5}+\frac{3}{5}=n$	E $n-\frac{15}{16}=3\frac{1}{4}$	L $n-6\frac{2}{3}=2\frac{3}{4}$	E $n-2287=6001$
F $4\frac{1}{3}+6\frac{3}{4}=n$	F $n-\frac{7}{8}=4\frac{11}{12}$	M $n-\frac{4}{5}=\frac{1}{3}$	F $1354+n=5211$
G $3\frac{3}{4}+1\frac{9}{16}=n$	G $\frac{4}{5}+\frac{1}{4}+\frac{3}{10}=n$	N $7\frac{3}{4}+8\frac{1}{6}=n$	G $n+3089=5640$

Learning how

Now you will learn how to subtract, using mixed numbers.

see

A

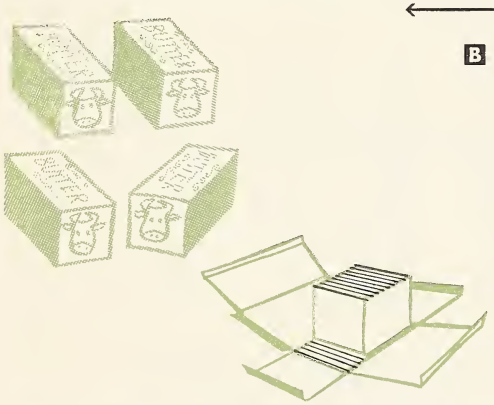


Mrs. Diamond has $4\frac{2}{3}$ lb. of butter. She plans to use $2\frac{3}{4}$ lb. for baking. How many pounds of butter will she have left?

$$4\tfrac{2}{3} - 2\tfrac{3}{4} = n$$

You must find this number.

B

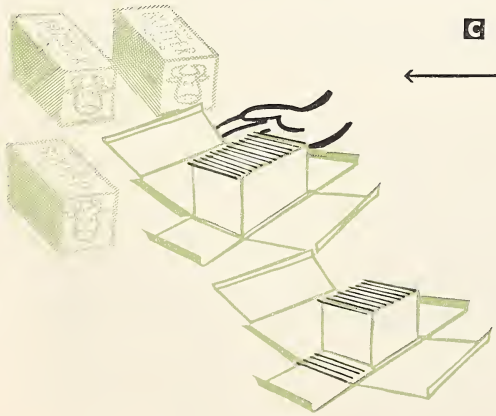


Before you can find out whether or not you can take $\frac{3}{4}$ lb. from the $\frac{2}{3}$ lb., you must think of $\frac{2}{3}$ lb. as $\frac{8}{12}$ lb. You must also think of $\frac{3}{4}$ lb. as $\frac{9}{12}$ lb. You cannot take $\frac{9}{12}$ lb. from $\frac{8}{12}$ lb.

$$4\tfrac{2}{3} = 4\tfrac{8}{12}$$
$$2\tfrac{3}{4} = 2\tfrac{9}{12}$$

Before you subtract, change the fraction numerals so that they will have a common denominator. You cannot subtract $\frac{9}{12}$ from $\frac{8}{12}$.

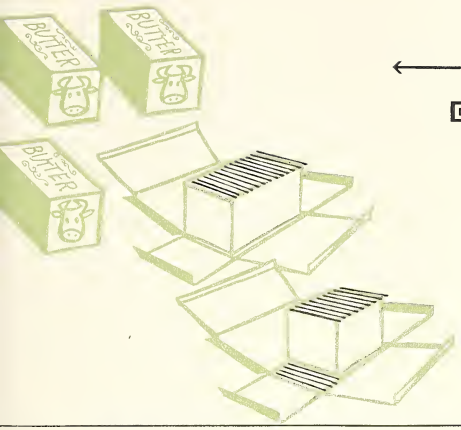
C



Before you can take away $\frac{9}{12}$ lb., you must have more twelfths. Open another pound of butter and put it with the $\frac{8}{12}$ lb. Think of the 1 pound as 12 twelfths.

$$4\tfrac{2}{3} = 4\tfrac{8}{12}$$
$$2\tfrac{3}{4} = 2\tfrac{9}{12}$$

Before you can subtract $\frac{9}{12}$, you must have more twelfths. Take 1 of the 4 ones and think of it as $\frac{12}{12}$. Put $\frac{12}{12}$ with $\frac{8}{12}$.



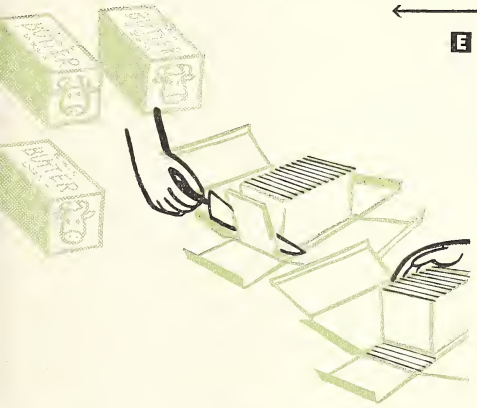
← Now you have 3 whole pounds and $\frac{20}{12}$ lb.

D

$3\frac{20}{12}$ ← Now there are 3 ones and $\frac{20}{12}$.

$4\frac{2}{3} = 4\frac{8}{12}$

$2\frac{3}{4} = 2\frac{9}{12}$



← Take away $\frac{9}{12}$ lb. The amount left is $\frac{11}{12}$ lb.

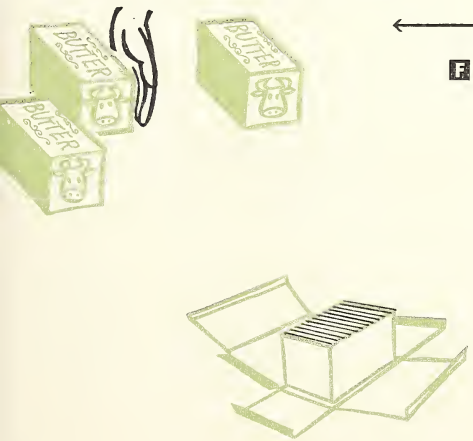
E

$3\frac{20}{12}$ ← Subtract $\frac{9}{12}$ from $\frac{20}{12}$. There are $\frac{11}{12}$ left.

$4\frac{2}{3} = 4\frac{8}{12}$

$2\frac{3}{4} = 2\frac{9}{12}$

$\frac{11}{12}$ ← Write $\frac{11}{12}$ here.



← Next take away 2 whole pounds. 1 pound will be left.

F

$3\frac{20}{12}$ ← Subtract 2 from 3. The answer is 1.

$4\frac{2}{3} = 4\frac{8}{12}$

$2\frac{3}{4} = 2\frac{9}{12}$

$1\frac{11}{12}$ ← Write the 1 here.

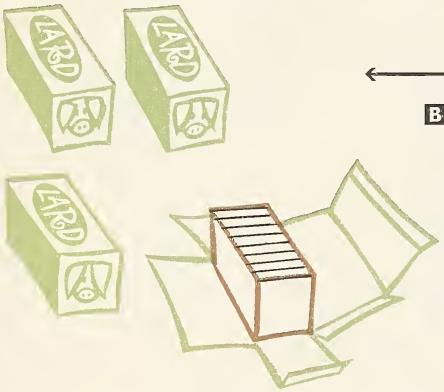
Mrs. Diamond will have $1\frac{11}{12}$ lb. of butter left.

$4\frac{2}{3} - 2\frac{3}{4} = 1\frac{11}{12}$

see

A Mrs. Brown had 4 lb. of lard. She used $1\frac{7}{8}$ lb. to cook doughnuts. How many pounds of lard did she have left?

$4 - 1\frac{7}{8} = n$ ← You must find this number.



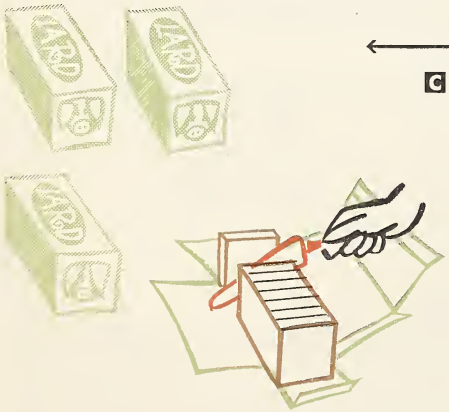
You cannot take away $\frac{7}{8}$ of a pound until a whole pound has been opened. Think of the opened pound as made up of eighths.

B Now there are 3 whole pounds and 8 eighths of a pound.

$3\frac{8}{8}$ ← Before you can subtract $\frac{7}{8}$, you must take 1 of the 4 ones and think of it as $\frac{8}{8}$. Now there are 3 ones and $\frac{8}{8}$.

4

$1\frac{7}{8}$



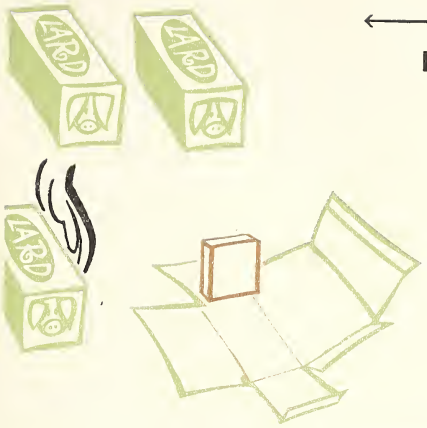
C Now take $\frac{7}{8}$ of a pound from the $\frac{8}{8}$ of a pound. $\frac{1}{8}$ of a pound will be left.

$3\frac{8}{8}$ ← Subtract $\frac{7}{8}$ from $\frac{8}{8}$. $\frac{1}{8}$ is left.

4

$1\frac{7}{8}$

$\frac{1}{8}$ ← Write the $\frac{1}{8}$ here.



D

Take 1 pound from 3 pounds. 2 pounds will be left.

Subtract 1 from 3. The answer is 2.

$$\begin{array}{r} 3\frac{8}{8} \\ \not{4} \\ -\ 1\frac{7}{8} \\ \hline 2\frac{1}{8} \end{array}$$

Write the 2 here.

Mrs. Brown had $2\frac{1}{8}$ pounds of lard left.

$4 - 1\frac{7}{8} = 2\frac{1}{8}$

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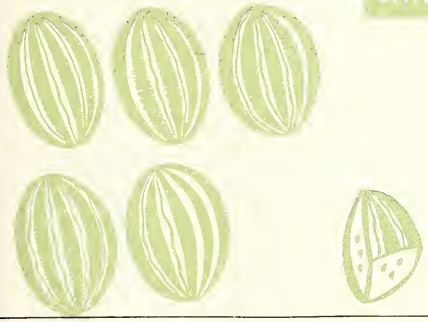
think



A

Mr. Cross had $5\frac{1}{4}$ watermelons when he opened his store. Mr. Baker bought $4\frac{3}{4}$ watermelons for a picnic. How many watermelons did Mr. Cross have left?

$5\frac{1}{4} - 4\frac{3}{4} = n$

You must find this number.

B

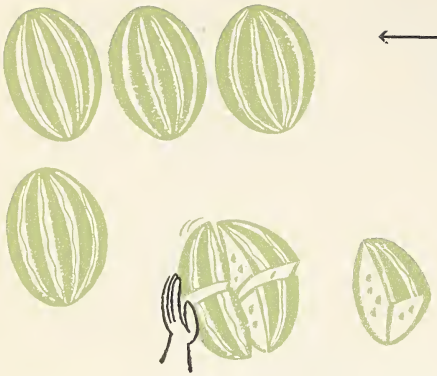
First take away the $\frac{3}{4}$ watermelon. How do you know right away that another watermelon will have to be cut? Into how many equal parts should it be cut? Why?

Do you have to change the fraction numerals?

$$\begin{array}{r} 5\frac{1}{4} \\ -\ 4\frac{3}{4} \\ \hline \end{array}$$

How do you know that you need more fourths before you can subtract?

Now turn the page.

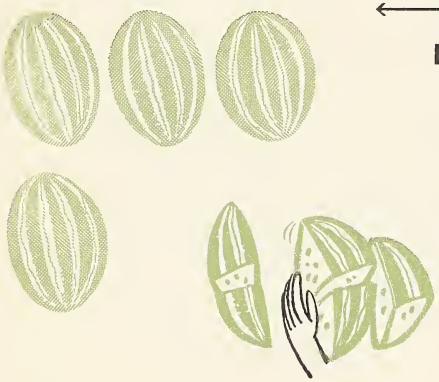


C

What do you do with the cut-up watermelon?
Now there are how many whole watermelons?
Now there are how many fourths?

$4\frac{5}{4}$ ← How do you get $4\frac{5}{4}$?

$5\frac{1}{4}$
$4\frac{3}{4}$



D

Can you take the $\frac{3}{4}$ of a watermelon from the $\frac{5}{4}$? How many fourths will be left?

$4\frac{5}{4}$ ← Subtract $\frac{\square}{4}$ from $\frac{5}{4}$.
$\frac{\square}{4}$ will be left.

$5\frac{1}{4}$
$4\frac{3}{4}$

Why do you write $\frac{2}{4}$ here?
Can you also express $\frac{2}{4}$ as $\frac{1}{2}$?

$\frac{2}{4}$

E

How many whole watermelons do you take away? How many will be left?

$4\frac{5}{4}$ ← Subtract $\square$ from $\square$.
What is left?

$5\frac{1}{4}$
$4\frac{3}{4}$

$\frac{2}{4}$ ← Why do you not write a numeral here?

Mr. Cross had $\frac{2}{4}$, or $\frac{1}{2}$, of a watermelon left.
$5\frac{1}{4} - 4\frac{3}{4} = \frac{\square}{\square}$ or $\frac{\square}{\square}$

try

A Mrs. Woods bought 5 grapefruit. She used $3\frac{1}{2}$ of them for breakfast. How many grapefruit did she have left?

$5 - 3\frac{1}{2} = n$

Why do you write 5 as $4\frac{2}{2}$?

B Jane had $6\frac{3}{4}$ yd. of cloth. She used $2\frac{3}{4}$ yd. How much cloth did she have left?

$6\frac{3}{4} - 2\frac{3}{4} = n$

Why do you not write a fraction numeral here?

C $8\frac{7}{8} - 5\frac{1}{3} = n$

Why do you not have to use 1 of the 8 ones?

D $11\frac{9}{10} - 7 = n$

E $9\frac{1}{6} - 8\frac{2}{3} = n$

do

F Mrs. Fisher bought a 5-lb. box of sugar. She used $3\frac{1}{4}$ lb. for canning. How much sugar was left?

$5 - 3\frac{1}{4} = n$

G Tony's mother collected $7\frac{1}{2}$ doz. eggs. She sold 5 doz. of them. How many dozen eggs did she have left?

$7\frac{1}{2} - 5 = n$

Show your answers in simplest form.

G $4\frac{11}{12} - 3\frac{1}{12} = n$

D $1\frac{1}{6} - \frac{5}{8} = n$

E $6\frac{2}{3} - 5\frac{4}{5} = n$

F $4\frac{11}{12} - 1\frac{1}{6} = n$

G $7\frac{3}{4} - 3\frac{1}{4} = n$

H $5\frac{3}{8} - \frac{9}{16} = n$

I $8\frac{3}{5} - 2 = n$

J $11\frac{1}{8} - 5\frac{3}{4} = n$

K $12\frac{1}{4} - 7\frac{2}{3} = n$

L $16\frac{4}{5} - 10\frac{1}{3} = n$

M $23\frac{1}{3} - 19\frac{7}{10} = n$

N $28 - 15\frac{3}{10} = n$

A $9\frac{1}{2} - 3\frac{1}{2} = n$

B $5\frac{7}{10} - 3\frac{1}{5} = n$

C $1\frac{1}{6} - 1\frac{1}{8} = n$

D $7\frac{1}{2} - 4\frac{7}{8} = n$

E $8\frac{3}{4} - 7\frac{5}{16} = n$

F $6\frac{2}{5} - \frac{3}{4} = n$

G $18\frac{1}{3} - 16\frac{2}{3} = n$

H $26\frac{11}{16} - 19 = n$

I $40\frac{9}{10} - 21\frac{1}{10} = n$

J $34 - 17\frac{5}{8} = n$

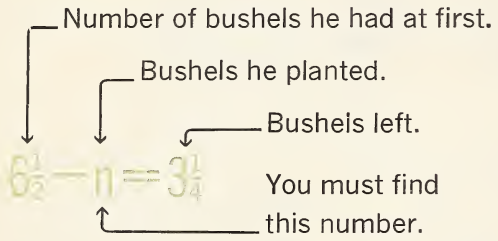
K $27\frac{1}{6} - 14\frac{3}{4} = n$

L $18\frac{1}{2} - 9\frac{7}{10} = n$

Now you should be able to subtract when you have mixed numbers.

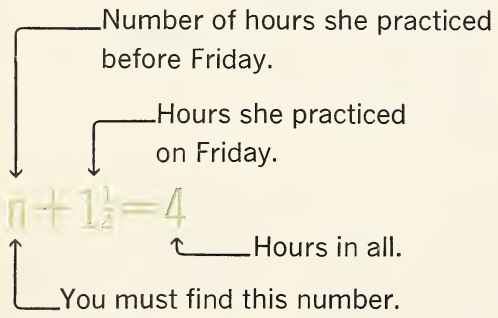
Using arithmetic

A Mr. Field had $6\frac{1}{2}$ bu. of potatoes. He planted some of them and then had $3\frac{1}{4}$ bu. left. How many bushels of potatoes had he planted?



Subtract $3\frac{1}{4}$ from $6\frac{1}{2}$.

B On Friday Jane practiced $1\frac{1}{4}$ hr. for the school play. Then she said, "I have practiced 4 hours so far this week." How many hours had she practiced before Friday?

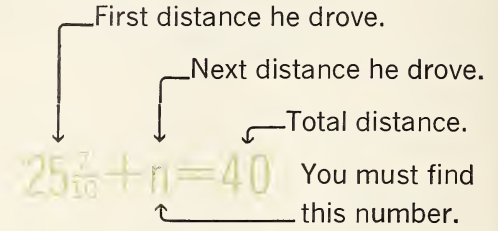

Number of hours she practiced before Friday.
Hours she practiced on Friday.
$n + 1\frac{1}{4} = 4$
Hours in all.
You must find this number.

Subtract $1\frac{1}{4}$ from 4.

C A farmer had 100 bu. of peaches. Then he sold $31\frac{3}{4}$ bu. How many bushels of peaches did he have left?

$100 - 31\frac{3}{4} = n$

D Mr. Page drove $25\frac{7}{10}$ mi. from his home to Springton. He then drove to Sugar Hill. When he reached there, he had driven 40 mi. How far did he drive going from Springton to Sugar Hill?



Subtract $25\frac{7}{10}$ from 40.

E Ann and Mary bought hot dogs for a picnic. Mary bought $1\frac{1}{2}$ lb., and Ann bought the rest. Altogether they had $3\frac{1}{4}$ lb. of hot dogs. How many pounds of hot dogs did Ann buy?

F Jim grew $45\frac{1}{2}$ bu. of corn. He saved $10\frac{1}{2}$ bu. for seed and sold the rest. How many bushels did he sell?

G One morning, Tony worked for Mr. Price. In the afternoon he worked $1\frac{3}{4}$ hr. for Mr. Page. He said, "I have worked $3\frac{1}{4}$ hours today." How many hours had he worked for Mr. Price?

H When Jack made a dog house, he used $4\frac{1}{3}$ ft. from a board that was $5\frac{1}{2}$ ft. long. How long was the unused part of the board?

I A store had $36\frac{7}{8}$ yd. of printed cloth. $13\frac{3}{4}$ yd. were sold in 2 hr. Then how many yards of the cloth were left to be sold?

J Susan's mother bought 26 lb. of tomatoes. After she had canned some, she had $3\frac{1}{4}$ lb. of tomatoes left. How many pounds of tomatoes had she canned?

K Mrs. Hope needed $2\frac{1}{2}$ cups of powdered sugar to make frosting. She found she had only $1\frac{2}{3}$ cups. How much more powdered sugar did she need?

L Mrs. Hope made $6\frac{1}{2}$ doz. doughnuts. She kept 2 doz. for her family and gave the rest to be sold at the school fair. How many dozen did she give for the school fair?

M A very large truck and its load together weighed 36 T. The truck weighed $15\frac{1}{2}$ T. How heavy was the load?

N Jim raked leaves before dinner one day. Then he worked for $\frac{3}{4}$ of an hour after dinner to finish. He had worked $1\frac{1}{2}$ hr. in all raking leaves. How long had he raked leaves before dinner?

O Pat made a model boat in $4\frac{3}{4}$ hr. He worked $2\frac{1}{2}$ hr. on Friday, and did the rest of the work on Saturday. How long did he work on Saturday?

P The library is $1\frac{9}{10}$ mi. west of Bob's house. To get there, Bob walked $\frac{1}{4}$ mi. west to the bus and then rode the rest of the way. How far did Bob ride on the bus?

Checking up

Test 1

A $\frac{3}{8}+\frac{5}{8}=n$

B $\frac{1}{2}+\frac{3}{4}=n$

C $\frac{1}{3}+\frac{3}{5}+\frac{4}{5}=n$

D $\frac{5}{6}+\frac{1}{8}+\frac{3}{4}=n$

E $\frac{7}{12}+\frac{1}{2}+\frac{5}{6}=n$

F $\frac{9}{10}+\frac{7}{10}=n$

G $\frac{4}{5}+\frac{3}{4}+\frac{3}{5}=n$

H $\frac{5}{8}+\frac{11}{16}=n$

I $\frac{2}{3}+\frac{3}{4}=n$

Test 2

A $2\frac{1}{6}+3\frac{5}{6}=n$

B $1\frac{1}{4}+\frac{4}{5}+2\frac{1}{2}=n$

C $3\frac{3}{4}+6\frac{11}{12}=n$

D $6\frac{9}{10}+7\frac{1}{4}=n$

E $9\frac{3}{16}+11\frac{1}{4}=n$

F $\frac{3}{5}+\frac{1}{2}+6\frac{7}{10}=n$

G $17\frac{1}{3}+21\frac{5}{8}=n$

H $24+16\frac{4}{5}=n$

I $10\frac{3}{8}+6\frac{3}{4}=n$

Test 3

A $\frac{7}{12}-\frac{1}{12}=n$

B $\frac{4}{5}-\frac{2}{3}=n$

C $\frac{5}{6}-\frac{3}{8}=n$

D $\frac{3}{4}-\frac{1}{6}=n$

E $\frac{7}{8}-\frac{2}{3}=n$

F $\frac{7}{10}-\frac{1}{5}=n$

G $\frac{13}{16}-\frac{1}{16}=n$

H $\frac{9}{10}-\frac{1}{2}=n$

I $\frac{3}{5}-\frac{1}{4}=n$

Test 4

A $11\frac{3}{5}-2\frac{4}{5}=n$

B $13\frac{7}{10}-6=n$

C $5\frac{1}{4}-4\frac{2}{3}=n$

D $9\frac{3}{8}-2\frac{5}{6}=n$

E $8-5\frac{7}{12}=n$

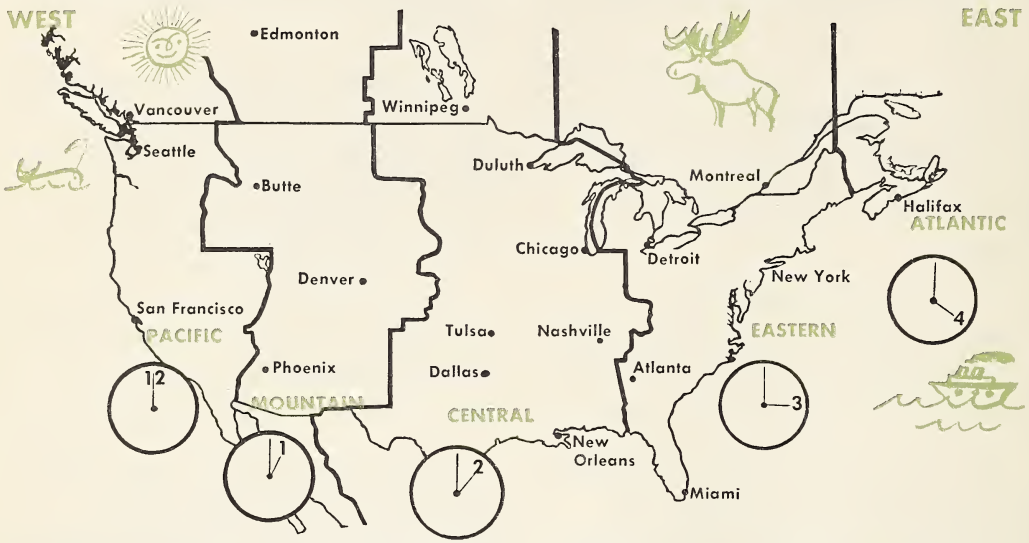
F $6\frac{5}{8}-5\frac{5}{8}=n$

G $2\frac{2}{3}-1\frac{4}{5}=n$

H $7\frac{5}{12}-\frac{2}{3}=n$

I $3\frac{1}{10}-2\frac{9}{10}=n$

Side trip



A The world is divided into 24 time zones. How many are shown on the map? In which zone do you live?

B Name the zones east of you. Name the zones west of you.

C Look at the clocks on the map above. They show what the standard time is in each of the other zones when it is noon in the Pacific Time Zone. Imagine that you live in California and that you want to telephone a friend in New York. If you know that your friend wants you to call him at noon by his clock, when should you telephone by Pacific Standard Time?

D In what time zone will it be noon when it is two o'clock in the afternoon in the Eastern Time Zone? In what zone will it be one o'clock?

E If you travel from west to east, crossing several time zones, how should you change your clock? How should you change your clock when you travel from east to west?

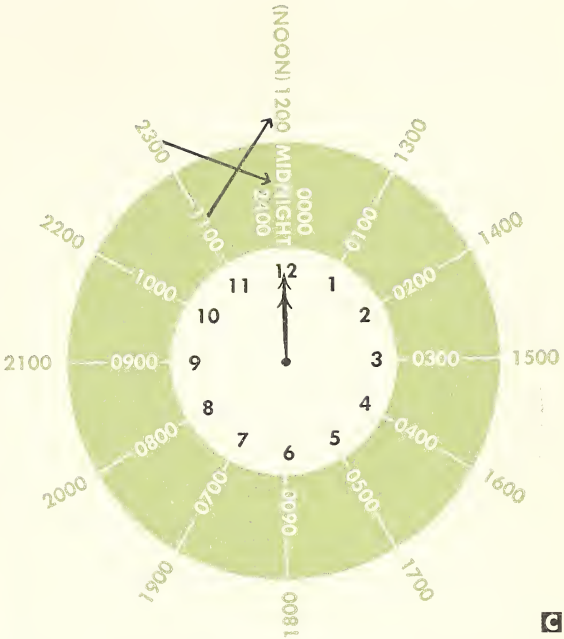
F What time is it now in your classroom? What time is it now in each zone on the map?

G What would happen if everyone would set his clock at 12 noon when the sun is exactly overhead?

12:05 A.M.

12:05 P.M. A

B



C

H What towns near you have the same time as you do? Why is it a good thing to set all clocks in a zone so that they tell the same time?

I In some places, "daylight-saving" time is used in summer. At 6 P.M. standard time, a clock that has been set for daylight-saving time shows 7 o'clock. How does this add an extra hour of daylight to the end of the day? Where does this hour of daylight come from?

J Look at Clock B above. How do you write the time it shows if it is morning? How do you write the time if it is night? Clock A will help you.

K Picture C shows another way to write time. The P.M. hours are shown with green numerals. How is 1 P.M. expressed?

L A.M. hours are shown with white numerals. How is 1 A.M. expressed?

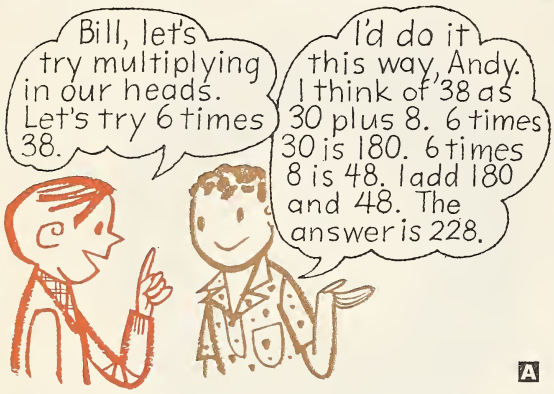
M 12:35 A.M. is written as 0035. How is 12:35 P.M. written?

N If it is 3:30 P.M., how do you write the time in this new way?

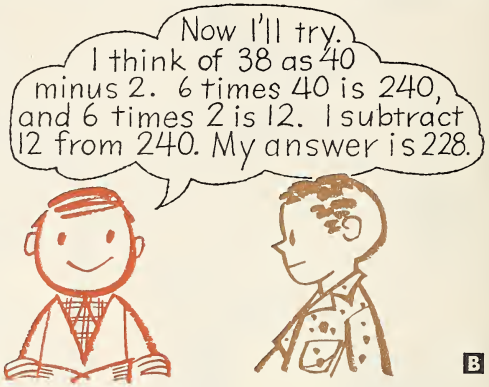
O Picture C shows two ways to write the time at midnight. What are they?

P How would you write the next hour after 1100? How would you write the next hour after 2300?

Thinking straight


Bill, let's try multiplying in our heads. Let's try 6 times 38.
I'd do it this way, Andy. I think of 38 as 30 plus 8. 6 times 30 is 180. 6 times 8 is 48. I add 180 and 48. The answer is 228.

A



B

A In Picture A, why did Bill add 48 to 180?

B In Picture B, why did Andy subtract 12 from 240?

C To multiply 64 by 7, think of 64 as $60+4$. Then multiply 60 by ▒ and multiply 4 by ▒. Now what do you add? What is the answer?

D To multiply 79 by 8, think of 79 as $80-1$. Then multiply 80 by ▒ and multiply 1 by ▒. Now subtract ▒ from 640. What is the answer?

E Multiply 52 by 8 in your head. Use the way shown in Picture A. Think of 52 as $50+$ ▒.

F Multiply 47 by 4 in your head. Use the way shown in Picture B. Think of 47 as ▒ -3.

G Use the way shown in Picture A to multiply 47 by 4. This time think of 47 as $40+$ ▒.

H When you multiply 47 by 4, is the work easier if you think of 47 as $40+7$ or as $50-3$?

Multiply in your head. Use the way that is easier for you.

A $6\times24=n$
B $7\times19=n$
C $3\times76=n$
D $5\times64=n$
E $8\times18=n$
F $9\times38=n$
G $3\times46=n$
H $7\times24=n$
I $6\times52=n$
J $9\times27=n$

Do these examples in your head.

A $54+63=n$
B $46-19=n$
C $81-43=n$
D $28+77=n$
E $95+23=n$
F $149-125=n$
G $218+312=n$
H $624-338=n$
I $101-87=n$
J $446+89=n$

Checking up

Test 1

A Mrs. Wood had 144 flower bulbs. Then she gave some of her bulbs to a neighbor. She had 108 bulbs left to plant. How many bulbs did Mrs. Wood give to her neighbor?

B Mr. Diamond bought a gallon of paint for $4.29 and a paint brush for $2.89. He gave the clerk at the paint store a 10-dollar bill. How much money should the clerk have given him in change?

C Tony mailed some packages at the post office. The packages weighed 3 lb., 5 lb., 2 lb., and 6 lb. What was the average weight of the packages?

D Miss Parks asked each of the 37 children in the fifth grade to bring a news story to school. 23 children brought news stories to school in the morning. How many of the children still had to bring their news stories?

E Sue went to the post office to buy some stamps. She bought twenty-five 3¢ stamps, eighteen 2¢ stamps, and fifteen 6¢ stamps. How much money did she spend for all the stamps?

F Kathy bought a blue dress for $8.75 and a red dress for $6.95. The blue dress cost how much more than the red dress?

G The steam engine that Don wants to buy costs $26.50. He has $19.32. How much more money does he need before he can buy the steam engine?

H Mary had some money in her bank. Then she earned $1.25 and put it in her bank. Now she has $5 altogether. How much money was in her bank before she earned the $1.25?

I Jim's bicycle cost $52, and Don's bicycle cost $67.95. Jim's bicycle cost how much less than Don's?

J After Bob and his father had gone 87 mi. on an automobile trip from their home to Newmarket, they saw a sign that said, "116 mi. to Newmarket." How far was it from their home to Newmarket?

K Kathy sold ice cream at the school fair. She sold it at 7¢ a dish. At the end of the afternoon, she had sold $5.46 worth. How many dishes of ice cream had she sold?

L The fifth-grade boys and girls hoped to sell 200 tickets for a play. Eight of the girls said they would make the tickets. If each of the girls made the same number, how many tickets did each girl make?

Test 2

A $9176 + 2542 = n$
B $7670 + 4345 = n$
C $5006 + n = 7694$
D $1684 + n = 3302$
E $n + 5874 = 6958$
F $2654 + 3648 = n$
G $795 + n = 6852$
H $n + 8947 = 9748$
I $n + 1655 = 4263$

Test 3

Find the sum.

A 365, 812, 581, 297
B 6634, 8701, 4324
C 2448, 6763, 1579
D 9072, 7248, 4850
E 919, 632, 455, 170
F 2001, 7244, 5555
G 48369, 51642
H 93287, 7783

Test 4

A $5634 - n = 1218$
B $4006 - n = 2747$
C $9097 - 4390 = n$
D $n - 3804 = 1410$
E $5944 - 1699 = n$
F $86470 - 69708 = n$
G $78944 - n = 31142$
H $n - 42559 = 87548$
I $n - 68406 = 91321$

Test 5

A $287 \times 509 = n$
B $82 \times 1637 = n$
C $n \times 53 = 3498$
D $25 \times 709 = n$
E $71 \times n = 2059$
F $373 \times 568 = n$
G $925 \times 483 = n$
H $4132 \times 86 = n$
I $164 \times 327 = n$
J $28 \times 3004 = n$

Test 6

A $7809 \div 63 = n$
B $545 \div 19 = n$
C $1485 \div n = 55$
D $9176 \div n = 62$
E $6483 \div 80 = n$
F $52871 \div n = 91$
G $14191 \div 73 = n$
H $13581 \div n = 27$
I $3354 \div n = 39$
J $27041 \div 46 = n$

Test 7

A $\frac{5}{6} + \frac{1}{6} = n$
B $\frac{7}{8} + \frac{5}{12} = n$
C $n + \frac{2}{5} = \frac{2}{3}$
D $\frac{3}{5} + n = \frac{9}{10}$
E $\frac{5}{8} + \frac{5}{6} = n$
F $n + \frac{1}{8} = \frac{7}{16}$
G $\frac{7}{16} + n = \frac{3}{4}$
H $n + \frac{7}{10} = \frac{4}{5}$
I $\frac{5}{6} + \frac{3}{4} = n$

Test 8

A $3\frac{5}{8} + 7\frac{3}{16} = n$
B $9\frac{3}{4} + \frac{2}{3} = n$
C $n + 12\frac{3}{4} = 16\frac{1}{8}$
D $5\frac{3}{5} + n = 8\frac{2}{3}$
E $4\frac{2}{3} + 6\frac{1}{2} = n$
F $n + 9\frac{7}{10} = 12\frac{1}{2}$
G $2\frac{5}{8} + n = 4\frac{3}{4}$
H $11\frac{5}{8} + n = 14\frac{1}{3}$
I $7\frac{5}{16} + 8\frac{3}{4} = n$

Test 9

A $\frac{7}{12} - n = \frac{1}{3}$
B $n - \frac{3}{8} = \frac{1}{2}$
C $\frac{3}{4} - \frac{1}{6} = n$
D $\frac{5}{6} - \frac{2}{5} = n$
E $n - \frac{1}{4} = \frac{2}{5}$
F $\frac{7}{8} - \frac{5}{6} = n$
G $\frac{11}{12} - n = \frac{1}{2}$
H $\frac{9}{10} - n = \frac{7}{10}$
I $\frac{5}{8} - \frac{1}{3} = n$

Test 10

A $9\frac{3}{4} - 4\frac{1}{8} = n$
B $13\frac{1}{2} - 6\frac{7}{12} = n$
C $5\frac{7}{10} - n = 2\frac{2}{3}$
D $17\frac{5}{6} - n = 3\frac{1}{3}$
E $n - 8\frac{7}{16} = 4\frac{1}{2}$
F $9\frac{3}{4} - n = 1\frac{11}{12}$
G $n - 21\frac{2}{5} = 7\frac{1}{10}$
H $11\frac{1}{16} - 5\frac{9}{16} = n$
I $15\frac{7}{8} - n = 10\frac{5}{6}$

Test 11

A $\frac{2}{5} = \frac{\square}{30}$
B $\frac{8}{1} = \frac{24}{\square}$
C $\frac{32}{40} = \frac{4}{\square}$
D $\frac{12}{3} = \frac{\square}{1}$
E $\frac{5}{9} = \frac{25}{\square}$
F $\frac{3}{10} = \frac{\square}{30}$
G $\frac{25}{6} = \frac{50}{\square}$
H $\frac{64}{16} = \frac{\square}{2}$

Keeping skillful

A $147232 \div 287 = n$

```
287)147232 | 300
   86100   |
   61132   | 200
   57400   |
    3732   |  10
    2870   |
     862   |   2
     574   |
     288   |   1
     287   |
       1   | 513
```

```
287)147232 | 500
   143500  |
     3732  |  10
     2870  |
      862  |   3
      861  |
        1  | 513
```

B $862 \div 120 = n$

C $92354 \div 492 = n$

D $160310 \div 391 = n$

E $547352 \div 890 = n$

F $28600 \div 275 = n$

G $9899 \div 287 = n$

H $41574 \div 507 = n$

I $30238 \div 617 = n$

J $14829 \div 914 = n$

K $32595 \div 159 = n$

L $75369 \div 777 = n$

M $54810. \div 609 = n$

N $364952 \div 455 = n$

A $1360 \div n = 8$

B $8163 \div 9 = n$

C $5474 \div n = 7$

D $546 \div n = 6$

E $684 \div 19 = n$

F $1955 \div n = 23$

G $1275 \div 85 = n$

H $6478 \div n = 79$

I $5401 \div 73 = n$

J $4233 \div 51 = n$

K $25568 \div 94 = n$

L $19778 \div n = 29$

M $9900 \div 171 = n$

N $93774 \div 125 = n$

O $83640 \div n = 205$

P $613632 \div n = 752$

Q $67845 \div 183 = n$

R $512635 \div n = 815$

A $\frac{2}{9} + \frac{1}{2} = n$

B $\frac{8}{9} - \frac{2}{3} = n$

C $n + 1\frac{1}{2} = 5\frac{3}{10}$

D $12\frac{15}{16} + n = 22\frac{7}{16}$

E $\frac{7}{16} + \frac{3}{4} = n$

F $n - 6\frac{3}{4} = 1\frac{5}{6}$

G $6\frac{3}{4} - n = 3\frac{7}{8}$

H $14\frac{7}{12} + 8\frac{5}{12} = n$

I $11\frac{2}{5} + n = 12\frac{2}{3}$

J $8\frac{5}{6} - n = 5\frac{3}{8}$

K $10\frac{1}{4} + n = 12\frac{5}{16}$

L $8 - n = \frac{4}{9}$

M $n + \frac{1}{6} = \frac{11}{18}$

N $\frac{13}{18} + 2\frac{1}{3} = n$

O $n - \frac{3}{4} = \frac{7}{12}$

P $2\frac{1}{4} + 6\frac{5}{6} = n$

A 27 da. = ▒ hr.

B 35 bu. = ▒ pk.

C ▒ tbs. = 46 fl. oz.

D ▒ in. = 96 ft.

E 56 pt. = ▒ gal.

F 322 da. = ▒ wk.

G 144 fl. oz. = ▒ c.

H ▒ lb. = 17 T.

I 180 sec. = ▒ min.

J 22 pt. = ▒ qt.

K 252 in. = ▒ yd.

L ▒ qt. = 14 gal.

M 360 ft. = ▒ yd.

N ▒ mo. = 53 yr.

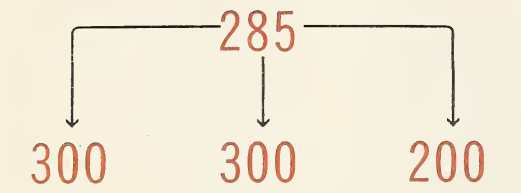
O 72 c. = ▒ pt.

P ▒ things = 41 doz.

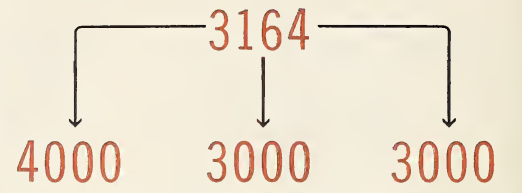
Q 24 hr. = ▒ min.

R 132 pk. = ▒ bu.

Thinking straight



A



B

Round each of the following numbers to the higher hundred, the lower hundred, and the nearer hundred. For Example A you would have 600, 500, and 500.

A 503	E 144	I 970
B 872	F 823	J 2061
C 455	G 3197	K 935
D 391	H 208	L 1580

Round each of the following numbers to the higher thousand, the lower thousand, and the nearer thousand.

M 6542	Q 23769	U 29880
N 5579	R 11368	V 57301
O 8116	S 72384	W 82500
P 9774	T 40698	X 74615

A $162 \div 3 = 54$, and $27 \div 3 = 9$. Will $54 \div 9$ give the same answer as $162 \div 27$? Why?

B $180 \div 10 = 18$, and $30 \div 10 = 3$. Will $18 \div 3$ give the same answer as $180 \div 30$? Why?

C The short-cut way to divide 180 by 30 is first to divide each number by 10. $180 \div 30 = 18\not{0} \div 3\not{0}$. The answer is ▒.

D The short-cut way to divide 3200 by 400 is first to divide each number by 100. $3200 \div 400 = 32\not{0}\not{0} \div 4\not{0}\not{0}$. The answer is ▒.

E $1500 \div 50 = 150\not{0} \div 5\not{0}$, or ▒. Why do you cross out one zero in 1500?

Use the short cut and then divide.

F $2700 \div 30 = n$	L $1600 \div 400 = n$
G $210 \div 70 = n$	M $10800 \div 900 = n$
H $1600 \div 50 = n$	N $3600 \div 900 = n$
I $640 \div 80 = n$	O $22000 \div 500 = n$
J $4800 \div 80 = n$	P $1800 \div 200 = n$
K $5400 \div 60 = n$	Q $44000 \div 200 = n$

Thinking straight

Let's see! How many 23's should I try first? I'll write on the board what I think.
23)11468
A
I'll round 23 up to 30. I'll round 11468 down. I'll round it to 9000.
23)11468
30)9000
B
Why do you round it to 9000?
See the 3 in 30? See the 9 in 9000? I can divide 9 by 3. Next I'll cross out a 0 in 30 and in 9000.
23)11468
30)9000
C
Why do you cross out the zeros?
Because I can divide both 30 and 9000 by 10. 900 divided by 3 is 300. Now I know that I can try 300 groups of 23.
23)11468 | 300
6900
D

A $64895 \div 871 = n$

Round the divisor up to 900.

$871\overline{)64895}$ ← Round this number down to 63,000 because the 63 in 63,000 can be divided by the 9 in 900.

$900\overline{)63000}$ ← Why can you cross out 2 zeros in each numeral? Now divide 630 by 9. You can either do this work in your head or write it on paper.

$871\overline{)64895}\ \big|\ 70$
$\quad\ 60970$ ← Now you know that you can try 70 groups of 871.
$70 \times 871 = 60970$

Now turn the page.

Round the divisor up to 900.

```
871)64895|70
   60970
    3925
```

Round this number down to 3600. You choose 3600 because the 36 in 3600 can be divided by the 9 in 900.

900)3600

Why can you cross out 2 zeros in both the 900 and the 3600? How do you know that you can now try 4 groups of 871?

```
871)64895|70
   60970
    3925| 4
    3484
     441|74
```

$4 \times 871 =$ ▒

What is the answer?

B $3642 \div 65 = n$

Round 65 up to 70.

65)3642

Why should you round this down to 3500?

Why do you first try 50 groups of 65?

C $52163 \div 284 = n$

Round this up to ▒.

284)52163

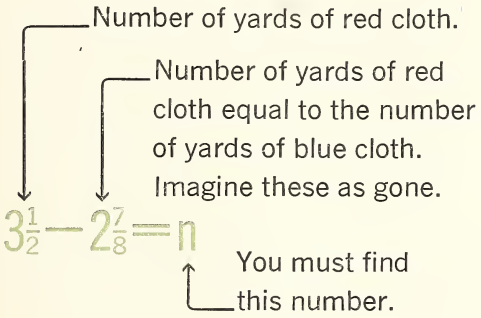
Why should you round this down to 30,000?

Try ▒ groups of 284 first.

- **A** $14283 \div 36 = n$
- **B** $8114 \div 119 = n$
- **C** $72036 \div 412 = n$
- **D** $2825 \div 25 = n$
- **E** $59116 \div 305 = n$
- **F** $42739 \div 59 = n$
- **G** $8442 \div 603 = n$
- **H** $11546 \div 86 = n$
- **I** $2431 \div 425 = n$
- **J** $9214 \div 17 = n$
- **K** $38157 \div 93 = n$
- **L** $39832 \div 293 = n$
- **M** $8080 \div 16 = n$
- **N** $45310 \div 92 = n$
- **O** $73164 \div 560 = n$
- **P** $85532 \div 158 = n$
- **Q** $9365 \div 29 = n$
- **R** $62128 \div 730 = n$
- **S** $6708 \div 78 = n$
- **T** $91000 \div 642 = n$
- **U** $27631 \div 289 = n$
- **V** $92004 \div 123 = n$
- **W** $36848 \div 98 = n$

Using arithmetic

A Jane has $3\frac{1}{2}$ yd. of red cloth and $2\frac{7}{8}$ yd. of blue cloth. Jane's piece of red cloth is how much longer than her piece of blue cloth?


Number of yards of red cloth.
Number of yards of red cloth equal to the number of yards of blue cloth. Imagine these as gone.
$3\frac{1}{2} - 2\frac{7}{8} = n$
You must find this number.

Subtract $2\frac{7}{8}$ from $3\frac{1}{2}$.
Jane's piece of red cloth is ▒ yd. longer than her piece of blue cloth.

B The answer for Problem A is the difference in the lengths of the two pieces of cloth. The difference in the lengths is ▒ yd.

C Jack weighs $57\frac{1}{2}$ lb., and his little brother weighs $28\frac{1}{4}$ lb. Jack's brother weighs how much less than Jack?

Subtract $28\frac{1}{4}$ from $57\frac{1}{2}$.
Jack's brother weighs ▒ lb. less than Jack.

D The answer for Problem C is the difference in the weights of the two boys. The difference in their weights is ▒ lb.

E Bob is $52\frac{3}{4}$ in. tall, and his little brother is $30\frac{1}{4}$ in. tall. What is the difference in their heights?

THINK To find the difference in their heights, you find how much taller or how much shorter one boy is than the other.

F Mrs. Brown's family uses $6\frac{1}{2}$ gal. of milk each week. Mrs. Page's family uses 4 gal. of milk each week. In a week, Mrs. Page's family uses how much less milk than Mrs. Brown's family?

G Mrs. Diamond used $2\frac{1}{4}$ c. of flour for bread and $1\frac{2}{3}$ c. of flour for cookies. She used how much more flour for bread than she did for cookies?

H Jim is $50\frac{1}{2}$ in. tall, and his sister is $48\frac{1}{4}$ in. tall. Jim's sister is how much shorter than Jim?

I Jim's father measured two trees that he had cut down. One was $31\frac{1}{2}$ ft. high, and the other was $26\frac{1}{2}$ ft. high. Find the difference in the heights of the two trees.

J Susan goes to school 3 hr. in the morning and $2\frac{1}{4}$ hr. in the afternoon. She goes to school how much longer in the morning than in the afternoon?

K A grocer sold $29\frac{1}{2}$ lb. of butter on Wednesday and 40 lb. of butter on Thursday. He sold how much less butter on Wednesday than he did on Thursday?

L Sally's father worked in the yard for $\frac{3}{4}$ hr. on Friday and for $3\frac{1}{4}$ hr. on Saturday. He worked how many fewer hours on Friday than on Saturday?

M Mrs. Park used $4\frac{1}{2}$ lb. of sugar for canning apples and $5\frac{1}{4}$ lb. for canning peaches. She used how much more sugar for the peaches than she did for the apples?

N Sally measured two pieces of cloth. One was $34\frac{3}{4}$ in. long, and the other was $37\frac{1}{2}$ in. long. Find the difference in the lengths of the two pieces of cloth.

O Paul practiced his cornet for $\frac{1}{2}$ hr. on Friday and for $\frac{3}{4}$ hr. on Saturday. He practiced how much longer on Saturday than he did on Friday?

P Jim's room is 11 ft. wide, and Tony's room is $9\frac{3}{4}$ ft. wide. Find the difference in the widths of the two rooms.

Q Mrs. Banks bought a chicken that weighed $5\frac{3}{8}$ lb. and a whitefish that weighed $2\frac{1}{2}$ lb. The chicken weighed how much more than the fish?

R The school is $1\frac{3}{10}$ mi. from Bill's house, and the library is $1\frac{9}{10}$ mi. from his house. The library is how much farther away from Bill's house than the school is?

S Tom weighed the two largest stones in his collection. One weighed $2\frac{1}{4}$ lb., and the other weighed $1\frac{7}{8}$ lb. What was the difference in the weights of the two stones?

Keeping skillful

Find the difference.

A $18\frac{7}{8}, 6\frac{1}{2}$

B 987, 419

C $11\frac{3}{4}, 1\frac{5}{6}$

D $25, 14\frac{9}{10}$

E 1000, 812

F 9142, 7639

G $33\frac{1}{2}, 30\frac{7}{8}$

H $9\frac{1}{5}, 8\frac{3}{5}$

I 6301, 2497

J $6\frac{3}{8}, 4\frac{1}{12}$

K $72\frac{5}{6}, 38\frac{5}{6}$

L 2700, 913

M 8468, 7977

N $21\frac{9}{16}, 14\frac{3}{16}$

Find the sum.

A $\frac{1}{8}, \frac{1}{4}, \frac{7}{16}$

B $6\frac{5}{6}, 3\frac{1}{8}, 9\frac{1}{2}$

C $\frac{11}{12}, \frac{7}{8}, \frac{2}{3}, \frac{3}{4}$

D $29\frac{1}{2}, 11\frac{1}{2}$

E $7\frac{1}{4}, 9\frac{7}{12}, 1\frac{2}{3}$

F $1\frac{9}{10}, 3\frac{2}{5}, \frac{4}{5}, \frac{1}{10}$

G $\frac{3}{4}, \frac{5}{6}, \frac{7}{12}, \frac{1}{3}$

A $834 \times 467 = n$

B $n \times 27 = 8208$

C $56 \times n = 43344$

D $79 \times 1039 = n$

E $98 \times 627 = n$

F $49 \times n = 3185$

G $86 \times 1566 = n$

H $n \times 54 = 44280$

I $106 \times 943 = n$

Keeping skillful

For each exercise below, write a ratio to express a rate or a comparison. When you have done this, write another ratio to express the same rate or comparison. Your work for Exercise A might look like this.

A $\frac{18}{24} = \frac{3}{4}$ or A $\frac{24}{18} = \frac{4}{3}$

A Nancy made 18 decorations. Carol made 24 decorations.

B Bill walked 4 mi. in 2 hr.

C Mary made 14 decorations in 40 minutes.

D Mrs. Price used 2 c. of sugar for 4 c. of apple juice.

E Mr. Price drove 260 mi. in 6 hr.

F Bob had 10 white mice. Tony had 5 white mice.

G Jim had 27 model cowboys. Bill had 36 model cowboys.

H Tony has read 54 pages of a book about stars. Don has read 100 pages of the same book.

I Mrs. West paid 39¢ for 1 doz. oranges.

J Mrs. West used 2 t. of baking powder for 4 c. of flour.

K Jane bought 4 oz. of candy for 21¢.

L Bob bought 25 sheets of notebook paper. Don bought 50 sheets of the same kind of paper.

M Jane bought 1 doz. flowers for 90¢.

N Tom earned $1.20. Jack earned 75¢.

O Ann sold 42 birthday cards. Kathy sold 20 birthday cards.

Find the missing numeral in each example below.

A $\frac{18}{6} = \frac{6}{\square}$

B $\frac{2}{3} = \frac{\square}{30}$

C $\frac{15}{25} = \frac{\square}{5}$

D $\frac{4}{3} = \frac{8}{\square}$

E $\frac{9}{10} = \frac{\square}{20}$

F $\frac{14}{5} = \frac{28}{\square}$

G $\frac{5}{6} = \frac{\square}{36}$

H $\frac{35}{28} = \frac{5}{\square}$

I $\frac{3}{4} = \frac{\square}{12}$

J $\frac{24}{60} = \frac{2}{\square}$

K $\frac{11}{6} = \frac{\square}{12}$

L $\frac{27}{18} = \frac{\square}{2}$

M $\frac{7}{15} = \frac{14}{\square}$

N $\frac{10}{9} = \frac{\square}{36}$

O $\frac{51}{24} = \frac{\square}{8}$

P $\frac{20}{72} = \frac{10}{\square}$

Q $\frac{7}{8} = \frac{42}{\square}$

R $\frac{18}{21} = \frac{\square}{7}$

S $\frac{48}{32} = \frac{12}{\square}$

T $\frac{3}{5} = \frac{\square}{30}$

U $\frac{5}{9} = \frac{20}{\square}$

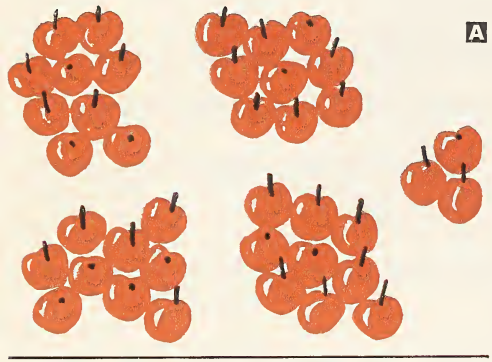
V $\frac{44}{12} = \frac{11}{\square}$

W $\frac{16}{36} = \frac{\square}{9}$

X $\frac{24}{10} = \frac{72}{\square}$

Moving forward

Often there is a remainder in a division example. Now you will learn how to write a fraction numeral in the answer when there is a remainder.



A

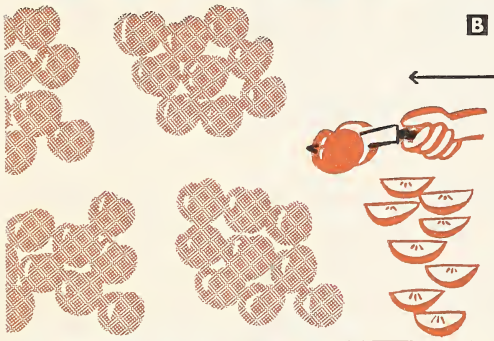
Four boys decided to divide 39 apples equally among them. How many apples would each boy get?

$39 \div n = 4$ Divide 39 by 4.

$$\begin{array}{r|l} 4\overline{)39} & 9 \\ 36 & \\ \hline 3 & \end{array}$$

Each boy would get 9 whole apples.

3 apples would be left over.

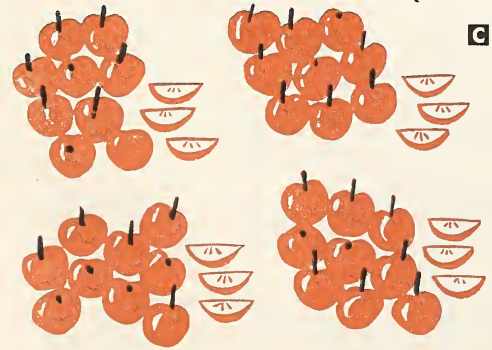


B

To divide the 3 left-over apples, the boys would have to cut each apple into 4 equal pieces, or fourths.

Each boy would get 3 of the equal pieces.

Each boy would get $\frac{3}{4}$ of an apple.



C

$$\begin{array}{r|l} 4\overline{)39} & 9\frac{3}{4} \\ 36 & \\ \hline 3 & \end{array}$$

Instead of leaving 3 as a remainder, write a fraction numeral in the answer. The numerator will be the remainder, 3. The denominator will be the divisor, 4.

Each boy would get $9\frac{3}{4}$ apples.

A Patsy and Sue made 27 cupcakes and shared them equally. How many cupcakes did each girl get?

$27 \div n = 2$ Divide 27 by 2.

$27 \div 2 =$ ▩ and ▩ remainder

You may say that each girl got $13\frac{1}{2}$ cupcakes. How do you get the $\frac{1}{2}$?

B Kathy weighs 74 lb., Sue weighs 68 lb., Carol weighs 75 lb., and Ruth weighs 69 lb. What is the average weight of the 4 girls?

▩ $\div n = 4$ Divide 286 by 4.

Why do you use 4 in the equation?

The average weight of the girls is $71\frac{▩}{4}$ lb., or $71\frac{▩}{2}$ lb.

Use each remainder to write a fraction numeral in simplest form in the answer.

C $52 \div n = 8$

D $37 \div n = 4$

E $74 \div n = 9$

F $58 \div n = 6$

G $22 \div n = 4$

H $273 \div n = 5$

I $137 \div n = 2$

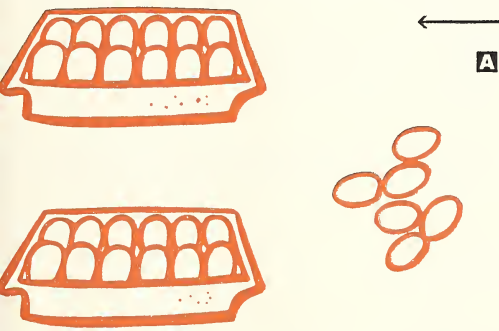
J $326 \div n = 4$

K $619 \div n = 8$

L $1421 \div n = 3$

M $2462 \div n = 7$

N $804 \div n = 9$



A

Ruth gathered 30 eggs. She gathered how many dozen eggs?

$30 \div 12 = n$

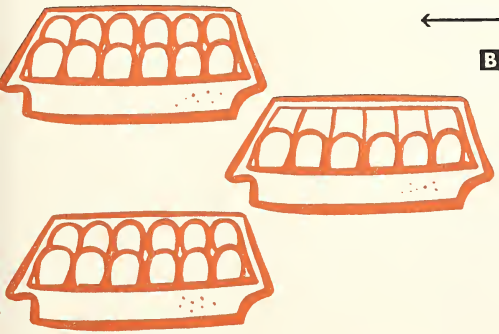
$$\begin{array}{r|l} 12\overline{)30} & 2 \\ 24 & \\ \hline 6 & \end{array}$$

There are 2 dozen eggs.

6 eggs are left over.

The 6 left-over eggs are part of a dozen.

They are $\frac{6}{12}$, or $\frac{1}{2}$, of a dozen.



B

$$\begin{array}{r|l} 12\overline{)30} & 2\frac{6}{12} \\ 24 & \\ \hline 6 & \end{array}$$

Use the remainder to write a fraction numeral in the answer. Write ▩ for the numerator. Write ▩ for the denominator.

Ruth gathered $2\frac{6}{12}$ doz., or $2\frac{1}{2}$ doz., eggs.

A Mrs. Long said, "We have used 11 quarts of milk this week." This was equal to how many gallons?

$11 \div 4 = n$

$11 \div 4 =$ ▢ and ▢ remainder

Why do you divide by 4? What is the remainder? You may write $\frac{3}{4}$ in the answer. Does the $\frac{3}{4}$ mean quarts or gallons? 11 qt. $= 2\frac{\square}{\square}$ gal.

B Jane measured a piece of crepe paper and found that it was 87 in. long. She said, "I have $7\frac{1}{4}$ ft. of crepe paper." Was Jane correct?

$87 \div 12 = n$

$87 \div 12 =$ ▢ and ▢ remainder

Why do you divide 87 by 12? The remainder is ▢ in. 3 in. are $\frac{\square}{12}$, or $\frac{\square}{4}$, of a foot. 87 in. $= 7\frac{\square}{\square}$ ft.

Use each remainder to write a fraction numeral in simplest form in the answer.

C $25 \div 2 = n$
D $46 \div 4 = n$
E $17 \div 3 = n$
F $38 \div 5 = n$
G $71 \div 4 = n$
H $19 \div 2 = n$
I $105 \div 6 = n$
J $294 \div 12 = n$
K $87 \div 35 = n$
L $76 \div 16 = n$
M $54 \div 8 = n$
N $119 \div 3 = n$

Now you should be able to write a fraction numeral in the answer to a division example when there is a remainder.

Keeping skillful

If there is a remainder, remember to write a fraction numeral in simplest form in the answer.

A 74 in. = ▢ ft.
B 23 pt. = ▢ qt.
C 25 da. = ▢ wk.
D 46 c. = ▢ pt.
E 52 oz. = ▢ lb.
F 32 things = ▢ doz.
G 39 mo. = ▢ yr.
H 47 pk. = ▢ bu.
I 17 pt. = ▢ gal.
J 28 fl. oz. = ▢ c.
K 49 ft. = ▢ yd.
L 80 oz. = ▢ lb.
M 18 mo. = ▢ yr.
N 21 pt. = ▢ gal.
O 240 sec. = ▢ min.
P 75 in. = ▢ yd.
Q 52 hr. = ▢ da.
R 19 ft. = ▢ yd.
S 27 qt. = ▢ gal.
T 24 oz. = ▢ lb.

Find the sum.

A $6\frac{1}{2}, \frac{1}{4}, 3\frac{1}{8}, 2\frac{1}{2}$
B $\frac{2}{3}, \frac{3}{5}, \frac{2}{5}, \frac{1}{3}$
C $10\frac{5}{6}, 11\frac{1}{3}$
D $\frac{5}{8}, 3\frac{1}{4}, 1\frac{5}{6}$
E $4\frac{11}{12}, 3\frac{2}{3}, 1\frac{1}{4}$
F $\frac{3}{4}, \frac{1}{3}, \frac{2}{3}$
G $1\frac{7}{10}, \frac{3}{5}, \frac{3}{10}, \frac{2}{5}$
H $2\frac{1}{2}, \frac{1}{4}, 6\frac{7}{8}$
I $5\frac{1}{6}, 2\frac{11}{12}, 7\frac{7}{12}$
J $6\frac{3}{4}, 1\frac{5}{6}, 8\frac{2}{3}$

Exploring problems

A

B

A Bill and David shared 11 candy bars equally. How many candy bars did each boy get?

$11 \div n = 2$

What is the remainder when you divide? Look at Picture A. The candy bars have been put into two equal groups. What happened to the 1 left-over bar? Is it possible to have $\frac{1}{2}$ candy bar? Can you say each boy got $5\frac{1}{2}$ bars?

B Three girls had 16 balloons to share equally. How many balloons should each girl have taken?

$16 \div n = 3$

Look at Picture B. Each girl could have ▒ balloons.
Is it more sensible to use a fraction in the answer or to have a remainder? Why?

C Mrs. Block wants to buy 30 buns. The buns are sold in packages of 8. How many packages should she buy?

$30 \div 8 = n$

THINK Which answer is most sensible, 3 packages, $3\frac{3}{4}$ packages, or 4 packages?

D Twenty-five children are going to the zoo in 6 cars. If they try to divide up into equal groups, how many children should ride in each car?

$25 \div n = 6$

THINK Is it sensible to have a fraction in the answer to Problem D? What should be done with the 1 child who is not in any of the equal groups?

E Ann bought 2 packages of cookies. There were 10 cookies in a package. She bought how many dozen cookies?

F Ellen bought 1 can of peaches at the rate of 3 cans for 94¢. Do you think she had to pay 31¢, $31\frac{1}{3}$¢, or 32¢ for the 1 can? Why do you think so?

THINK A fraction of a cent is usually counted as a whole cent.

G Jane has a ribbon 49 in. long. She wants to cut it into 4 equal pieces. How long should she make each piece?

THINK Why is it sensible to use a fraction in the answer?

H Six girls took 14 sandwiches on a picnic and shared them equally. How many sandwiches did each girl get?

THINK In Problem H, is it sensible to have a fraction in the answer? Why?

I Kathy bought 3 cans of salted nuts. Each can held 8 oz. of nuts. How many pounds of nuts did she buy?

THINK How many ounces are in 1 lb.?

J Don saved $1.27 in 8 weeks. He saved an average of how much per week?

THINK Is $15\frac{7}{8}$¢ about 15¢ or about 16¢? Which answer is more sensible for Problem J, about 15¢ or about 16¢?

K Bill practiced his cornet 30 min. on Monday, 20 min. on Tuesday, 35 min. on Wednesday, 15 min. on Thursday, 40 min. on Friday, and 25 min. on Saturday. He practiced an average of how many minutes per day for the 6 days?

THINK Is the remainder important in Problem K? Why or why not?

L Mrs. Turner bought 15 doz. eggs. She shared them equally with 3 other women. How many dozen eggs did each of the 4 women get?

M Paul is putting his rock collection in boxes. He has 75 rocks, and he wants to put 16 rocks in each box. How many boxes will he need?

N Mr. Turner spent $2 for gasoline for his car. The gasoline cost 32¢ per gallon. How many gallons of gasoline did he buy?

THINK Why should you have a fraction in the answer to Problem N?

O Mrs. Turner bought a 10-lb. bag of potatoes for 69¢. The potatoes cost about how much per pound?

P Mrs. Long needs 14 buttons to trim Patsy's dress. The buttons are sold on cards of 6. How many cards of buttons should she buy?

Sometimes you use the remainder in a division problem to express the answer with a fraction. Sometimes you round off the answer to a whole number.

Exploring problems

see

A

Candy bars are priced at 10¢ for 3 bars. Kathy wants to buy 6 bars. How much will she have to pay for 6 bars?

$\frac{10}{3}$ ← This ratio shows that the bars are sold at the rate of 10¢ per 3 bars.

B

Kathy wants to buy 6 bars. You do not know how much she will have to pay for them.

Kathy will pay for 6 bars at the same rate as for 3 bars, but now the rate will be expressed by two different numerals.

$\frac{n}{6}$ ← Number of cents Kathy will pay for 6 bars

← Number of bars Kathy wants to buy

$\frac{10}{3} = \frac{n}{6}$ ← You must find the numeral that replaces n.

The ratio n per 6 expresses the same rate as 10 per 3.

Now turn the page.

compute

It takes 2 groups of 3 bars to make the group of 6 bars that Kathy wants to buy.

C

$$\frac{10}{3} = \frac{n}{6}$$

You can multiply 3 by 2 to get 6.

It takes 10¢ to pay for each group of 3 bars. It will take 2 groups of 10¢ to pay for 2 groups of 3 bars. It will take 20¢.

D

$$\frac{10}{3} = \frac{n}{6}$$

6 can be found by multiplying 3 by 2. So the numeral that replaces n can be found by multiplying 10 by 2. $n = 20$

Kathy will have to pay 20¢ for the 6 bars.

---

see

Mrs. Cook bought 8 bars of soap for 60¢. At this rate, how much would 2 bars cost?

A

$$\frac{60}{8}$$

This ratio shows that Mrs. Cook bought soap at the rate of 60¢ for 8 bars.

B

You do not know how much 2 bars would cost.

$\frac{n}{2}$ ← Number of cents 2 bars will cost

← Number of bars

The rate for 2 bars is the same as the rate for 8 bars, but the rate has now been expressed by different numerals.

$\frac{60}{8} = \frac{n}{2}$ ← You must find the numeral that replaces n.

compute

C

You can think of the 8 bars as divided into groups of 2 bars. There are 4 groups.

$\frac{60}{8} = \frac{n}{2}$

You can divide 8 by 4 to get 2.

D

It takes 60¢ to pay for 4 groups of 2 bars. So divide 60¢ into 4 equal groups to find how much each group of 2 bars cost.

$\frac{60}{8} = \frac{n}{2}$

2 can be found by dividing 8 by 4. So the numeral that replaces n can be found by dividing 60 by 4. $n = 15$

2 bars would cost 15¢.

see

A

Mrs. Parks paid 57¢ for some grapefruit. They were priced at 19¢ for 2. How many grapefruit did she buy?

What do 19 and 2 stand for?

What do 57 and n stand for?

$$\frac{19}{2} = \frac{57}{n}$$

You must find the numeral that replaces n.

compute

B

How many groups of 19¢ make the 57¢ that Mrs. Parks spent for grapefruit? How many groups of 2 grapefruit did she buy?

$$\frac{19}{2} = \frac{57}{n}$$

You can multiply 19 by ▒ to get 57. So you can multiply 2 by ▒ to get the numeral that replaces n.

Mrs. Parks bought ▒ grapefruit.

see

A

Mrs. Parks also bought 6 cans of baby food for 76¢. The baby food was selling at the rate of how many cans for 38¢?

What does each numeral in this ratio stand for?

What do 38 and n in this ratio stand for?

$$\frac{76}{6} = \frac{38}{n}$$

You must find the numeral that replaces n.

compute

B

Think of the 76¢ as divided into groups of 38¢. There are ▒ groups of 38¢. Then think of 6 cans as ▒ groups of ▒ cans.

$$\frac{76}{6} = \frac{38}{n}$$

You can divide 76 by ▒ to get 38. So you can divide 6 by ▒ to get the numeral that replaces n.

The baby food was selling at the rate of ▒ cans for 38¢.

A Mr. Cook traveled 65 mi. in 2 hr. in his car. At this rate, how far could he travel in 10 hr. in his car?

$$\frac{65}{2} = \frac{n}{10}$$

65 and the numeral you will get for n tell how many miles.

2 means 2 hr.

10 means 10 hr.

B There were 27 pupils in the music class. The class had 18 music books. This was a rate of how many books for every 3 pupils?

$$\frac{27}{18} = \frac{3}{n}$$

What do 27 and 3 stand for?

What do 18 and n stand for?

C Paul paid 75¢ for some balloons. They were priced at 10 for 25¢. How many balloons did Paul buy?

$$\frac{25}{10} = \frac{75}{n}$$

What do 25 and 75 stand for?

What do 10 and n stand for?

D Mrs. White bought 8 cans of corn for $1.40. At the same rate, how much would 2 cans of this corn have cost?

$$\frac{140}{8} = \frac{n}{2}$$

What do 140 and n stand for?

What do 8 and 2 stand for?

E Sally is making 24 invitations to a party. She thinks that she can make 4 invitations in about 30 min. It will take her about how many minutes to make the 24 invitations?

$\frac{4}{30}=\frac{24}{n}$ or $\frac{30}{4}=\frac{n}{24}$

F David saved \$3 in 12 weeks. He saved at the same rate during all this time. How much money did he save in 4 weeks?

$\frac{12}{300}=\frac{4}{n}$ or $\frac{300}{12}=\frac{n}{4}$

Why can \$3 be thought of as 300?

G John has a new book that has 280 pages. He has read 56 pages in 5 days. At this rate, how many days will it take him to read the whole book?

$\frac{5}{56}=\frac{n}{280}$ or $\frac{56}{5}=\frac{280}{n}$

H When Mrs. White made a custard, she used 6 eggs for 4 cups of milk. How many eggs should she have used if she had used only 2 cups of milk?

$\frac{6}{4}=\frac{n}{2}$ or $\frac{4}{6}=\frac{2}{n}$

I On a bicycle trip, Bill and his friends rode 9 miles in 2 hours. At this rate, how many miles could they ride in 6 hours?

J The fifth graders collected paper and sold it for 30¢ per 100 pounds. They received \$12.60 for all the paper that they sold. How many pounds of paper did they sell?

K Mrs. Brown paid 78¢ for 1 dozen cakes of soap. She bought the soap at the rate of how many cakes for 26¢?

L At another store Mrs. Brown saw the same kind of soap priced at 3 cakes for 23¢. How much would 12 cakes of soap cost at this store?

M Ruth bought 20 noisemakers for a party. They were priced at 2 for 25¢. How much did she pay for all of them?

N On a trip, Mr. Black drove 146 mi. in 4 hr. Then he still had 73 mi. to go. He traveled at the same rate for the next 73 mi. How long did it take him to travel the 73 mi.?

O Kathy used 100 ft. of crepe paper to decorate 50 ft. of the school hall. She still had 10 ft. of the hall to decorate. How many feet of crepe paper did she need for the 10 ft.?

P Paul and his friends went on an 8-mi. hike. They walked the first 2 mi. in 36 min. If they kept walking at this rate, how long did it take them to go the rest of the way?

Now you should know how to express rates by using ratios and how to use these ratios to solve problems.

Exploring problems

see

A

John earns 25¢ a day, and Bob earns 15¢ a day. When John has earned $1.25, how much will Bob have earned?

$$\frac{25}{15}$$

This ratio compares the amount John earns in a day with the amount Bob earns in a day.

B

When John has earned $1.25, the ratio that you use to compare his earnings with Bob's will be equal to the ratio 25 to 15.

$$\frac{125}{n}$$

125 ← Number of cents John has earned

n ← Number of cents Bob will have earned

The ratio 125 to n expresses the same comparison as 25 to 15.

$$\frac{25}{15} = \frac{125}{n}$$

John's earnings in cents

Bob's earnings in cents. You must find the numeral that replaces n.

Now turn the page.

compute

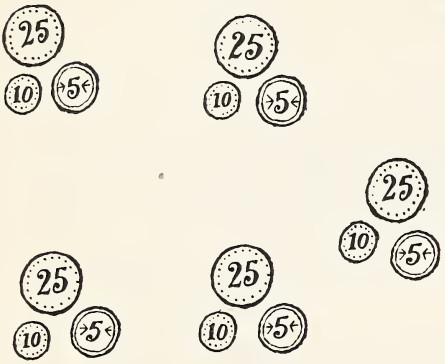
C

John has to earn 5 groups of 25¢ before he has earned a total of $1.25. Think of $1.25 as 125¢.

$\frac{25}{15} = \frac{125}{n}$

You can multiply 25 by 5 to get 125.

D



Every time John earns 25¢, Bob earns 15¢. So when John has earned 5 groups of 25¢, or $1.25, Bob will have earned 5 groups of 15¢. He will have earned 75¢.

$\frac{25}{15} = \frac{125}{n}$

$n = 75$

You can multiply 25 by 5 to get 125. So you can multiply 15 by 5 to get the numeral that replaces n.

Bob will have earned 75¢ when John has earned $1.25.

see

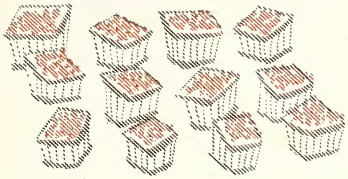
A

One day Tony picked 12 qt. of berries. In the same time, Bill picked 8 qt. How many quarts did Tony pick for each 2 qt. that Bill picked?

$\frac{12}{8}$

This ratio compares the number of quarts Tony picked with the number of quarts that Bill picked.

B



You do not know how many quarts Tony picked for each group of 2 qt. Bill picked.

But you can make a ratio that compares the unknown number of quarts that Tony picked with the 2 qt. that Bill picked.

$\frac{n}{2}$ ← Number of quarts Tony picked

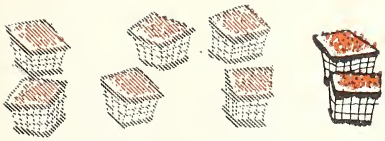
$\frac{n}{2}$ ← Number of quarts Bill picked

The ratio n to 2 expresses the same comparison as the ratio 12 to 8.

$\frac{12}{8} = \frac{n}{2}$

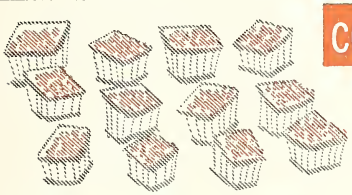
Number of quarts Tony picked

Number of quarts Bill picked



compute

C



Think of Bill's 8 qt. as divided into groups of 2 qt. There are 4 groups.

$\frac{12}{8} = \frac{n}{2}$ ← 2 can be found by dividing 8 by 4.

D

Think of Tony's 12 quarts as divided into 4 equal groups of 3 quarts.

$\frac{12}{8} = \frac{n}{2}$

2 can be found by dividing 8 by 4. So the numeral that replaces n can be found by dividing 12 by 4. $n = 3$

Tony picked 3 qt. for each 2 qt. Bill picked.

see

A

Jim buys 20 stamps a month for his collection, and Don buys 16 stamps a month. How many stamps will Jim have bought when Don has bought 48 stamps?

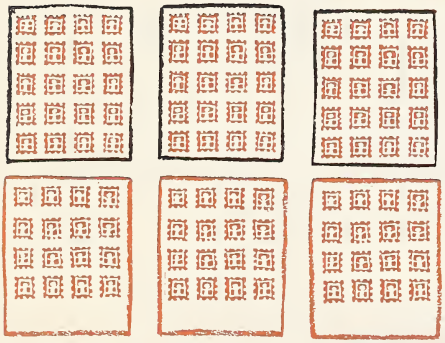
What do the 20 and 16 stand for?

What do the n and 48 stand for?

$$\frac{20}{16} = \frac{n}{48}$$

compute

B



How many groups of 16 stamps make the 48 stamps that Don has bought? Jim will then have bought ▒ groups of 20 stamps.

$$\frac{20}{16} = \frac{n}{48}$$

48 can be found by multiplying 16 by ▒. How do you find the numeral that replaces n?

Jim will have bought ▒ stamps when Don has bought 48 stamps.

see

A

Paul planted 36 young trees, and Tom planted 24. How many trees did Tom plant for each group of 18 that Paul planted?

What does each numeral stand for?

What do the 18 and n stand for?

$$\frac{36}{24} = \frac{18}{n}$$

compute

You can think of the 36 trees as divided into groups of 18 trees. There are ▒ groups.

$$\frac{36}{24} = \frac{18}{n}$$

18 can be found by dividing 36 by ▒. How do you find the numeral that replaces n?

Tom planted ▒ trees for each 18 trees that Paul planted.

A Mr. Price's car uses 5 gal. of gasoline while Mr. Brown's car uses 6 gal. When Mr. Price's car has used 30 gal. of gasoline, how many gallons will Mr. Brown's car have used?

$$\frac{5}{6} = \frac{30}{n}$$

The 5 and the 30 stand for the number of gallons used by Mr. Price's car.

The 6 and the n stand for the number of gallons used by Mr. Brown's car.

B Jack cut up 2 bu. of seed potatoes while Jim cut up 3 bu. How many bushels of potatoes did Jack cut up while Jim cut up 9 bu.?

$$\frac{2}{3} = \frac{n}{9}$$

What do the 2 and the n stand for?

What do the 3 and the 9 stand for?

C A large wheel on a machine turns 50 times a minute. A smaller wheel on the same machine turns 120 times a minute. When the larger wheel has turned 10 times, how many times has the smaller wheel turned?

$$\frac{50}{120} = \frac{10}{n}$$

What do the 50 and the 10 stand for?

What do the 120 and the n stand for?

D Mrs. Bird has a picture that is 10 in. wide and 12 in. long. She wants to have a small print made that will be only 6 in. long. How wide will this small print be?

$$\frac{10}{12} = \frac{n}{6}$$

What do the 10 and the n stand for?

What do the 12 and the 6 stand for?

E Patsy saves 4 pennies a day, and Jane saves 6 pennies a day. When Patsy has saved 56 pennies, how many pennies will Jane have saved?

$\frac{4}{6}=\frac{56}{n}$ or $\frac{6}{4}=\frac{n}{56}$

F Bob rode 16 mi. on his bicycle during the same time that Jim rode 12 mi. on his bicycle. How far did Bob ride during the time that Jim rode 3 mi.?

$\frac{16}{12}=\frac{n}{3}$ or $\frac{12}{16}=\frac{3}{n}$

G Mr. Page and Mr. White left at the same time to drive from Garden City to Grand Springs, a distance of 210 mi. Mr. Page drove at 30 mi. per hour, and Mr. White drove at 35 mi. per hour. How far had Mr. Page driven when Mr. White had arrived at Grand Springs?

$\frac{30}{35}=\frac{n}{210}$ or $\frac{35}{30}=\frac{210}{n}$

H In a race, one car traveled 500 mi. while a second car traveled 350 mi. How far had the first car traveled when the second car had traveled 35 mi.?

$\frac{500}{350}=\frac{n}{35}$ or $\frac{350}{500}=\frac{35}{n}$

I The Point Diamond lighthouse flashes 18 times while the Point Jupiter lighthouse flashes 12 times. When the Point Diamond lighthouse has flashed 90 times, how many times has the Point Jupiter lighthouse flashed?

J Mary saved 60¢, and Tony saved 80¢. How much money did Tony save for each 15¢ that Mary saved?

K Steve has a picture that is 3 in. wide and 4 in. long. He plans to have a larger picture made that will be 12 in. long. How wide will this larger picture be?

L A machine made 160 parts a minute. Another machine made 120 parts of the same kind in a minute. When the first machine had made 40 parts, how many parts had the second machine made?

M Kathy skated 150 ft. while Sally skated 80 ft. For each 15 ft. that Kathy skated, how far did Sally skate?

N At the Burns School, 39 boys and 26 girls play in the school band. How many boys play in the band for each two girls that play in the band?

Now you should be able to express comparisons by using ratios. You should also be able to use the ratios to solve problems.

Exploring problems

A

B

A Sally found 16 shells, and Kathy found 8 shells. Sally found how many times as many shells as Kathy?

To answer the question, you must find how many shells Sally found for each shell that Kathy found.

First compare the 16 shells that Sally found with the 8 shells that Kathy found. Look at Picture A. Write a ratio to express this comparison.

$\frac{16}{8}$ ← Number of Sally's shells
← Number of Kathy's shells

You can also write a ratio to show how many shells Sally found for each one that Kathy found.

$\frac{n}{1}$ ← Number of Sally's shells
← Number of Kathy's shells

Now you have expressed the same comparison with two equal ratios. Look at the equation below.

$\frac{16}{8} = \frac{n}{1}$

1 can be found by dividing 8 by 8. So the numeral that replaces n can be found by dividing 16 by 8. $n = 2$

$\frac{16}{8} = \frac{2}{1}$

Sally found 2 shells for each shell that Kathy found. Look at Picture B.

Sally found 2 times as many shells as Kathy.

In working with the ratios, you found the numeral that replaces n by dividing 16 by 8. Why do you divide by 8?

C

D

B Ann bought 12 buns. Ruth bought 3 times as many buns as Ann. How many buns did Ruth buy?

When you say that Ruth bought 3 times as many buns as Ann, you know that she bought 3 buns for each bun that Ann bought.

Look at Picture C. You can compare Ruth's buns with Ann's buns by using the ratio 3 to 1.

You can also compare Ruth's buns with Ann's buns by using the ratio n to 12.

$\frac{3}{1} = \frac{n}{12}$

12 can be found by multiplying 1 by 12. So the numeral that replaces n can be found by multiplying 3 by 12. $n = 36$

$\frac{3}{1} = \frac{36}{12}$ ← Ruth bought 36 buns.

In working with the ratios, you found the numeral that replaces n by multiplying 3 by 12. Why do you multiply by 12?

C Tony has 20 arrowheads. He has 4 times as many arrowheads as Paul. How many arrowheads has Paul?

When you say that Tony has 4 times as many arrowheads as Paul, you know that Tony has 4 arrowheads for each one that Paul has. Look at Picture D.

Use the ratio 4 to 1 to compare Tony's arrowheads with Paul's. The ratio 20 to n also compares Tony's arrowheads with Paul's. The two ratios express the same comparison and are equal. Look at the equation below.

$\frac{4}{1} = \frac{20}{n}$

20 can be found by multiplying 4 by 5. So the numeral that replaces n can be found by multiplying 1 by 5. $n = 5$

$\frac{4}{1} = \frac{20}{5}$ ← Paul has 5 arrowheads.

In working with the ratios, you found the numeral that replaces n by first dividing 20 by 4. Then you multiplied 1 by ▒.

D Don has 18¢. Jim has 5 times as much money as Don. How much money does Jim have?

When you say that Jim has 5 times as much money as Don, you know that Jim has 5 pennies for each one of Don's.

Jim's money in cents

$\frac{5}{1} = \frac{n}{18}$

Don's money in cents

18 can be found by multiplying 1 by 18. How can you find the numeral that replaces n?

Why can you find how much money Jim has by multiplying 5 by 18?

E Andy made 9 model boats. Tom made 3 model boats. Andy made how many times as many boats as Tom?

One ratio must tell how many boats Andy made for each boat Tom made. What must the other ratio tell? The two ratios are equal.

Number of Andy's model boats

$\frac{9}{3} = \frac{n}{1}$

Number of Tom's model boats

1 can be found by dividing 3 by 3. How do you find the numeral that replaces n?

To find how many times as many boats Andy made as Tom, divide ▒ by 3. Why do you divide by 3?

F Susan picked 15 daisies. She picked 3 times as many daisies as Nancy. How many did Nancy pick?

Susan picked 3 daisies for each one that Nancy picked.

Number of Susan's daisies

$\frac{3}{1} = \frac{15}{n}$

Number of Nancy's daisies

15 can be found by multiplying 3 by ▒. How do you find the numeral that replaces n?

To find how many daisies Nancy picked, first divide 15 by ▒. Then multiply 1 by ▒.

G George collected 12 masks, and Don collected 4 masks. George collected how many times as many masks as Don?

$$\frac{12}{4}=\frac{n}{1}$$

THINK The ratio 12 to 4 compares George's masks with Don's masks. What does the ratio n to 1 compare? Why can you divide 12 by 4 to get the numeral that replaces n?

H Pat has 23 coins in his collection. Andy has 3 times as many coins as Pat. How many coins does Andy have?

$$\frac{3}{1}=\frac{n}{23}$$

THINK What does the ratio 3 to 1 compare? What does the ratio n to 23 compare?

I Ellen has 40 butterflies. She has 2 times as many as Carol has. How many butterflies does Carol have?

$$\frac{2}{1}=\frac{40}{n}$$

J June earned 80¢. She earned twice as much as George. How much money did George earn?

THINK When you say "twice as much," you mean "2 times as much."

K Ellen used 30 ft. of crepe paper for decorations, and Patsy used 15 ft. Ellen used how many times as much crepe paper as Patsy?

L Don saved 85¢. Steve said that he saved 6 times as much as Don. How much money did Steve save?

M Ann bought 12 noisemakers, and June bought 2. Ann bought how many times as many noisemakers as June?

N Paul found 28 rocks. This was 2 times as many rocks as Jack found. How many rocks did Jack find?

O One week Tony rode 12 mi. on his bicycle. That week Jim rode 3 times as many miles as Tony. How far did Jim ride?

P Paul bought 9 postcards. May bought twice as many postcards as Paul did. How many postcards did May buy?

Q Mr. Cook harvested 50 bu. of potatoes. Mr. Miner harvested 25 bu. Mr. Cook harvested how many times as many bushels as Mr. Miner?

R Kathy wrote 7 invitations for a party. June wrote 3 times as many invitations as Kathy did. How many invitations did June write?

Now you should understand how to use ratios to make equations to solve problems like those in this lesson.

Keeping skillful

A $64791 + 3295 = n$
B $n + 874 = 1063$
C $12236 - 3531 = n$
D $n - 3865 = 975$
E $54891 + n = 70000$
F $4127 + 8684 = n$
G $32481 - n = 18791$
H $6005 - 398 = n$
I $n - 76951 = 53824$
J $57739 + 12064 = n$
K $8937 + 1605 = n$

A $756 \times 69 = n$
B $3692 \times 83 = n$
C $48 \times 5647 = n$
D $824 \times 175 = n$
E $909 \times 725 = n$
F $185 \times 85 = n$
G $5280 \times 68 = n$
H $72 \times 3600 = n$
I $912 \times 348 = n$
J $33 \times 7914 = n$
K $4006 \times 81 = n$

If there is a remainder, write a fraction numeral in the answer.

A $2682 \div 36 = n$
B $27334 \div 79 = n$
C $5000 \div 32 = n$
D $24548 \div 646 = n$
E $7854 \div 66 = n$
F $75992 \div 826 = n$
G $16929 \div 72 = n$
H $600500 \div 875 = n$

A $734 \times 97 = n$
B $24905 \div n = 85$
C $5934 \times 630 = n$
D $38750 \div 120 = n$
E $350 \times n = 67550$
F $648 \times 317 = n$
G $17004 \div n = 436$
H $n \times 116 = 10672$
I $5036 \times 84 = n$

A $\frac{3}{8} + \frac{1}{6} = n$
B $2\frac{4}{5} + \frac{1}{3} + 6\frac{2}{5} = n$
C $11\frac{3}{10} + 8\frac{1}{2} = n$
D $\frac{3}{4} + \frac{2}{3} + \frac{5}{6} = n$
E $7\frac{7}{8} + 2\frac{5}{12} = n$
F $1\frac{9}{10} + 12\frac{1}{2} + 3\frac{1}{3} = n$
G $\frac{5}{6} + 5\frac{7}{12} = n$
H $\frac{2}{3} + 7\frac{1}{4} + \frac{5}{8} = n$

A $3\frac{1}{2} - 1\frac{1}{3} = n$
B $\frac{4}{5} - \frac{3}{10} = n$
C $11\frac{5}{12} - 1\frac{7}{8} = n$
D $\frac{15}{16} - \frac{3}{4} = n$
E $2\frac{1}{6} - \frac{2}{3} = n$
F $13\frac{7}{12} - 5\frac{3}{4} = n$
G $\frac{9}{10} - \frac{1}{2} = n$
H $2\frac{3}{5} - \frac{5}{6} = n$

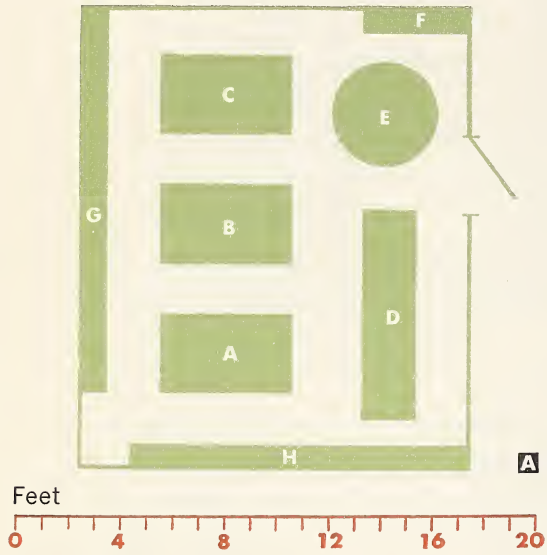
A $\frac{9}{10} - \frac{3}{4} = n$
B $6\frac{5}{12} + 3\frac{11}{12} = n$
C $2\frac{1}{2} - n = \frac{3}{5}$
D $n - 6\frac{2}{3} = 7\frac{3}{4}$
E $6 + n = 8\frac{9}{16}$
F $4\frac{1}{3} - \frac{7}{8} = n$
G $\frac{1}{5} + 18\frac{3}{4} = n$
H $n - 8\frac{1}{2} = \frac{5}{12}$
I $n + \frac{2}{3} = 7$

A 5 mi. = ▒ ft.
B ▒ gal. = 64 pt.
C 15 min. = ▒ sec.
D ▒ yd. = 288 in.
E 3 c. = ▒ tbs.
F ▒ pk. = 72 qt.
G 2 mi. = ▒ yd.
H 6 yr. = ▒ mo.
I ▒ lb. = 368 oz.
J 1 wk. = ▒ hr.

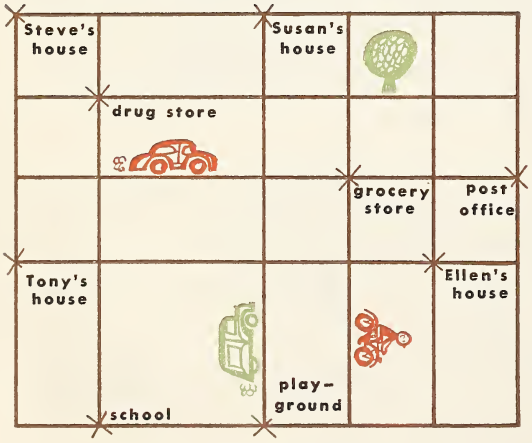
A $\frac{6}{15} = \frac{n}{60}$
B $\frac{26}{18} = \frac{13}{n}$
C $\frac{5}{18} = \frac{20}{n}$
D $\frac{3}{2} = \frac{n}{36}$
E $\frac{48}{72} = \frac{8}{n}$
F $\frac{4}{9} = \frac{28}{n}$
G $\frac{22}{14} = \frac{n}{7}$
H $\frac{2}{6} = \frac{n}{48}$

Moving forward

In this lesson you will learn about scales and scale drawings.



A



B

A Picture A is a scale drawing of the library at Downs School. The scale below the drawing shows how to measure lengths on the drawing in feet. How many feet in all does the scale represent? What numerals belong with the marks that are not already numbered?

B Put a paper along the scale. Put marks and numerals on the edge of the paper just as they are on the scale. Now you can find real distances represented on the scale drawing by putting your scale beside the line you want to measure. Find the real length and width of the library in this way.

C How long is Bookcase H? Is it the same length as Bookcase G?

D How wide is Bookcase F? Are all three bookcases the same width?

E What are the length and width of Tables A, B, and C? Of Table D?

F What is the diameter of Table E?

G How wide is the doorway?

H Now look at Picture B. The scale is shown below the map. The line is 1 inch long. So ▒ inch on the map represents ▒ mile of real distance.

I If you measure a distance of 2 in. on the map, how many miles will this distance represent?

J The distance between Steve's house and Susan's house is $1\frac{1}{2}$ in. on the map. How many miles apart are their houses?

K How far is the school from Steve's house? This is how much farther than the school is from Tony's house?

L One day Susan's mother asked her to ride to the drug store on her bicycle. How far did Susan have to ride in going to the drug store and back home again?

M Tony's house is how much farther from the playground than Ellen's house is?

N Tony's mother asked him to get some ice cream for dinner. He could buy the ice cream either at the drug store or at the grocery store. Which store would be nearer? How much nearer would it be?

O One day during lunch time the fifth-grade teacher, Mrs. West, drove from school to the post office and back to school. How far in all did Mrs. West drive?

Now you should know how to use a scale to measure distances on a scale drawing or map.

Keeping skillful

A $\frac{6}{1}=\frac{30}{n}$

B $\frac{2}{7}=\frac{n}{21}$

C $\frac{12}{3}=\frac{n}{1}$

D $\frac{20}{16}=\frac{10}{n}$

E $\frac{18}{6}=\frac{3}{n}$

F $\frac{8}{11}=\frac{n}{33}$

Find the sum.

A $\frac{2}{5}, \frac{4}{5}, \frac{3}{5}$

B $6\frac{7}{12}, 3\frac{1}{4}, \frac{1}{6}$

C $\frac{9}{16}, \frac{5}{16}, 2\frac{3}{16}$

D $1\frac{3}{4}, 7\frac{1}{5}, 8\frac{3}{5}$

E $\frac{1}{3}, \frac{5}{6}, 3\frac{1}{2}$

F $4\frac{1}{2}, 2\frac{3}{5}, \frac{1}{5}$

G $\frac{3}{8}, 7\frac{2}{3}, 9\frac{1}{2}$

H $4\frac{2}{3}, 6\frac{1}{5}, 8\frac{3}{5}$

I $\frac{9}{10}, 5\frac{1}{4}, 11\frac{3}{10}$

J $7\frac{1}{4}, 2\frac{5}{6}, 1\frac{2}{3}$

K $\frac{7}{8}, 6\frac{3}{4}, \frac{11}{16}$

A $n+3\frac{3}{4}=7\frac{1}{4}$

B $12\frac{1}{10}-4\frac{3}{5}=n$

C $n-5\frac{1}{3}=2\frac{4}{5}$

D $11-n=4\frac{5}{12}$

E $6\frac{1}{2}+n=7\frac{4}{5}$

F $18\frac{5}{6}-9=n$

G $14\frac{7}{8}-9\frac{1}{6}=n$

H $n+4\frac{1}{3}=6\frac{1}{5}$

I $1\frac{7}{8}+n=2\frac{3}{16}$

J $\frac{3}{4}-n=\frac{3}{10}$

K $n-7=8\frac{5}{8}$

L $n+\frac{9}{10}=4\frac{1}{3}$

M $16\frac{2}{3}-4\frac{7}{8}=n$

A $732\div 8=n$

B $1065\div n=5$

C $3782\div 7=n$

D $900\div 6=n$

E $5445\div n=9$

F $6237\div 7=n$

G $272\div 34=n$

H $926\div 28=n$

I $2795\div n=65$

J $4092\div 73=n$

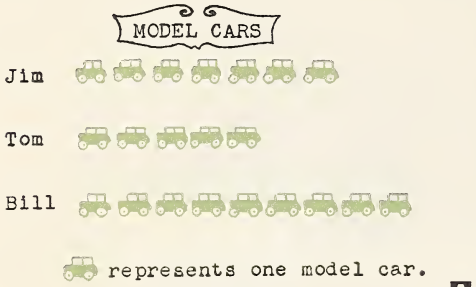
K $2773\div 59=n$

L $1156\div n=17$

M $59239\div 84=n$

Moving forward

In this lesson you will learn about graphs.



A

B

C

A Picture A is a graph that compares the model cars that Jim, Tom, and Bill have. This kind of graph is called a pictograph. Each picture of a car shown on the graph represents one model car. Find the longest line of cars. Which boy has the most cars?

B Are all the lines of cars nearly the same length? Do the boys have nearly the same number of cars apiece?

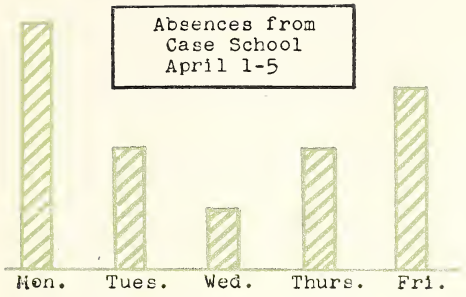
C How would this pictograph help you compare the number of cars the boys have without your knowing exactly how many cars each boy has? What would you have to do if you wanted to know exactly how many cars each boy has?

D Pictograph B shows how many quarts of milk the Springer family used in each of 4 weeks. Below the graph you are told that each bottle of milk on the graph represents ▒ quarts of milk really used.

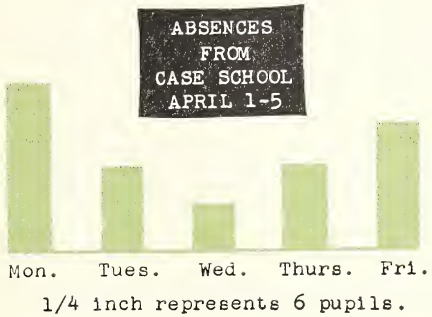
E How do you know that they used the most milk during the third week? They used the least milk during the ~~ week.

F What does Pictograph C show? The fifth graders have more ~~ than any other pet. They have fewer ~~ than any other pet.

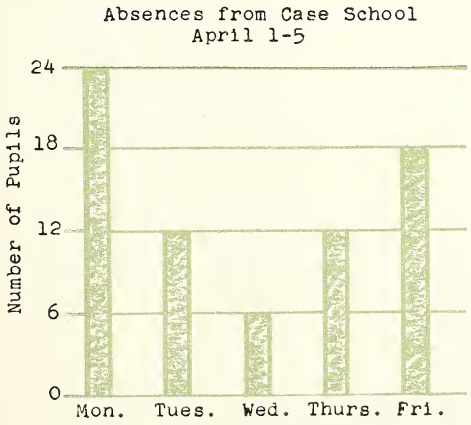
G Name the pets in the order of the number the children have. Begin with the smallest number of pets.



D



E



F

H Picture D shows another kind of graph, called a bar graph. This graph compares the number of absences at the Case School for the 5 school days during one week. Can you tell how many pupils were absent on any one day?

I How do you know that the most pupils were absent on Monday? On which day were the fewest pupils absent?

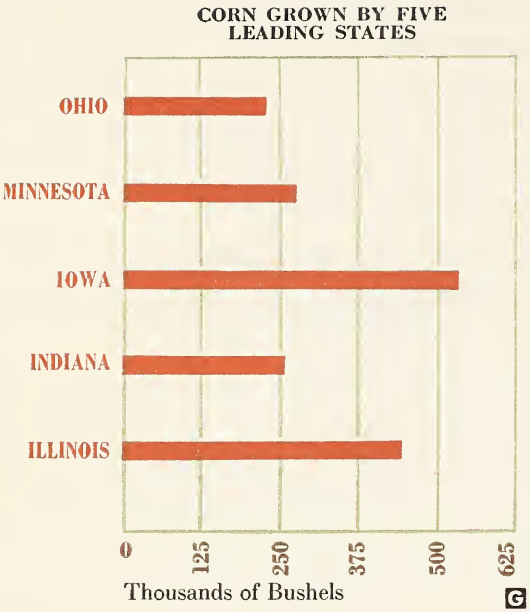
J The graph in Picture E also compares the same absences, but the bars are not the same length. You are told how the bars were measured when the graph was made. The bar for Monday is 1 in. long. How many pupils does it represent?

K How can you find out how many pupils each of the other bars represents?

L From Graph D you could not tell how many more pupils missed school on Tuesday than on Wednesday. Can you now find out exactly how many more pupils were absent on Tuesday than on Wednesday? How many more were absent?

M Another graph about the absences is shown in Picture F. Find the scale at the left of the graph. Use it to answer Question L.

N Imagine that you are going to make two different bar graphs to show the same facts. Must the bars that represent the same facts be the same length on both graphs?



G

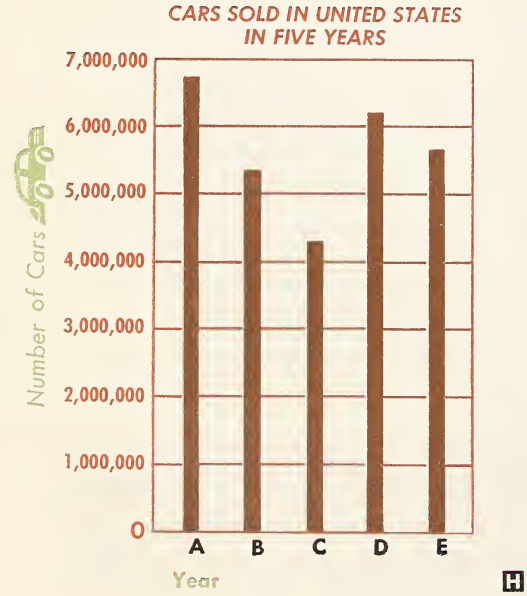
O Graph G shows the approximate number of bushels of corn grown in one year in the five states that grew the most corn. Which state grew the most corn?

P Look at the scale at the bottom of the graph. The 125 means 125,000 bu. What does each of the other numerals on the scale mean?

Q Did Ohio grow more than or fewer than 250,000 bushels of corn? Did Minnesota grow more or fewer bushels of corn than Indiana?

R Was the amount of corn grown in Illinois nearer to 375,000 bushels or to 500,000 bushels?

S List the states in the order of the amount of corn grown. Begin with the state that grew the most corn.

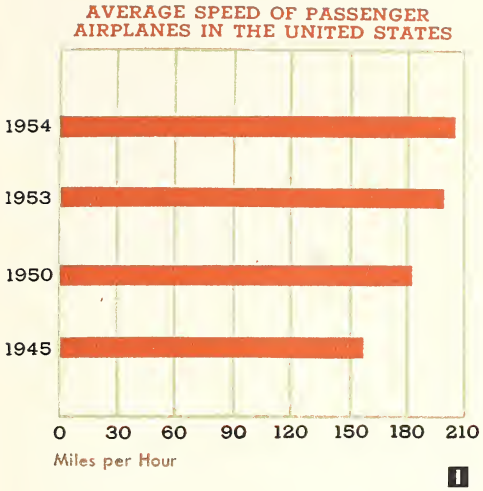


H

T Now look at Graph H. It shows the approximate number of cars sold in the United States in each of five years. In which year were the fewest cars sold?

U Were more cars sold in Year A or in Year E? Were more than 6,000,000 cars or fewer than 6,000,000 cars sold in Year D?

V List the years in the order of the number of cars sold. Begin with the year in which the fewest were sold.



I

W What does Graph I show? For what years does it show this? What do the numerals on the scale below the graph represent?

X Would you expect planes to be faster in 1954 than they were in 1945? Look at the graph to see if your answer is correct.

Y What was the approximate average speed of airplanes in 1950? In 1954?

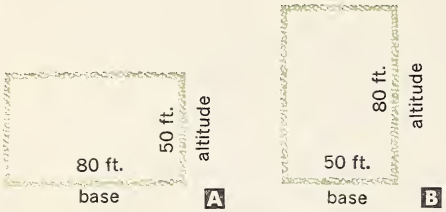
Z If the average speed of airplanes now were shown, do you think the bar on the graph would be longer than the bar for 1954? Why or why not?

Now you should know how to read graphs to compare many things.

Keeping skillful

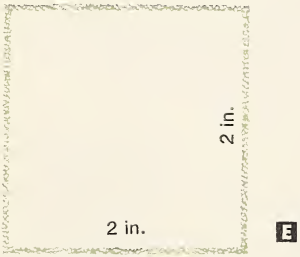
A	$n + 4261 = 6008$	**A**	$7 \times 3005 = n$	A	$836 \div 5 = n$
B	$9359 - 5806 = n$	**B**	$48 \times 629 = n$	B	$7031 \div 8 = n$
C	$30874 + n = 70211$	**C**	$80 \times n = 5200$	C	$5118 \div n = 6$
D	$6539 + 4208 = n$	**D**	$n \times 9 = 6381$	D	$378 \div 45 = n$
E	$89640 - n = 57753$	**E**	$536 \times 421 = n$	E	$593 \div 27 = n$
F	$n - 2683 = 10589$	**F**	$23 \times 5060 = n$	F	$567 \div n = 63$
G	$n + 77350 = 82005$	**G**	$n \times 37 = 7918$	G	$2190 \div 30 = n$
H	$6900 + n = 9112$	**H**	$704 \times 382 = n$	H	$22896 \div n = 72$
I	$n - 52346 = 3780$	**I**	$41 \times n = 3936$	I	$924 \div 15 = n$
J	$10061 - n = 2783$	**J**	$n \times 76 = 15808$	J	$8361 \div 50 = n$
K	$74312 - 8964 = n$	**K**	$525 \times 649 = n$	K	$6804 \div n = 18$
L	$n + 6070 = 8000$	**L**	$83 \times 2060 = n$	L	$43901 \div 95 = n$
M	$93002 - n = 87402$	**M**	$28 \times n = 15288$	M	$10962 \div n = 14$
N	$50689 - 37794 = n$	**N**	$77 \times 5199 = n$	N	$43688 \div n = 86$

Thinking straight

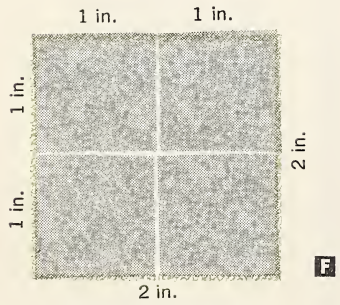


1-inch square

1 square inch
1 sq. in.



2-in. square



4 square inches
4 sq. in.

A Rectangles A and B are diagrams of two lots. The base shown for Rectangle A is ▒ ft., and the altitude shown is ▒ ft. The base shown for Rectangle B is ▒ ft., and the altitude shown is ▒ ft.

B The lengths of the base and altitude of a rectangle are its dimensions. What dimensions are shown for Rectangle A? For Rectangle B?

C If you were to describe Lot A, you might say that it is 80 ft. wide and 50 ft. deep. What is the width of Lot B? What is the depth of Lot B?

D Would you describe Lot A as 80 ft. long and 50 ft. high? Why or why not?

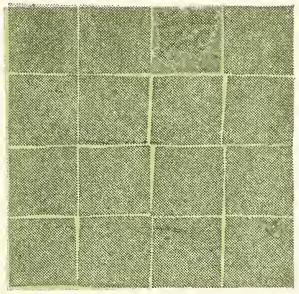
E Would you describe Lot B as 50 ft. wide and 80 ft. long? Why or why not? How do you decide which dimension is the width?

F What are the dimensions of Square C? Of Square D?

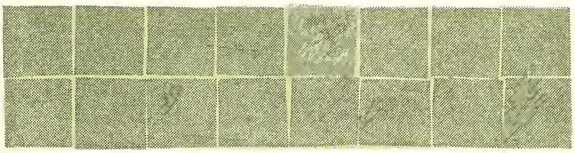
G Square C and Square D have the same area. This area is ▒ sq. in.

H Squares E and F are scale drawings of 2-inch squares. Do they have the same dimensions?

I Do Square E and Square F have the same area? The area of a 2-in. square is ▒ sq. in. Why is this area 4 sq. in. and not 2 sq. in.?



G



H

J The perimeter of Square D is ▒ in. The perimeter of Square F is ▒ in. The perimeter of Square F is how many times the perimeter of Square D?

K The area of Square D is ▒ sq. in. The area of Square F is ▒ sq. in. The area of Square F is how many times the area of Square D?

L The dimensions of Square G above are ▒ in. and ▒ in. Its perimeter is ▒ in. Its area is ▒ sq. in.

M The dimensions of Rectangle H are ▒ in. and ▒ in. Its perimeter is ▒ in. Its area is ▒ sq. in.

N Do Square G and Rectangle H have the same dimensions? Are both of them rectangles? Do they have equal perimeters? Are their areas equal?

O If you know only the perimeters of two lots that are in the shape of rectangles, can you tell which of the lots is larger? Why or why not?

Keeping skillful

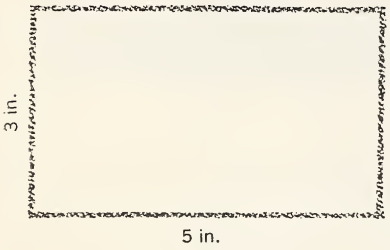
A $\frac{3}{4}+\frac{1}{8}+\frac{5}{6}=n$
B $11\frac{2}{3}+9\frac{7}{8}=n$
C $2\frac{1}{2}+\frac{11}{12}+1\frac{3}{4}=n$
D $14\frac{9}{10}+8\frac{5}{6}=n$
E $\frac{5}{8}+\frac{11}{16}+2\frac{3}{8}=n$
F $\frac{7}{12}+\frac{3}{4}+\frac{2}{3}=n$
G $\frac{11}{12}+3\frac{7}{8}+9\frac{7}{12}=n$
H $4\frac{9}{16}+28\frac{7}{8}=n$
I $20\frac{1}{4}+3\frac{3}{4}=n$

A $14\frac{2}{3}-11\frac{2}{3}=n$
B $\frac{7}{8}-\frac{5}{6}=n$
C $6\frac{1}{8}-2\frac{3}{4}=n$
D $12\frac{1}{2}-11\frac{5}{6}=n$
E $4\frac{1}{4}-2\frac{3}{4}=n$
F $19\frac{11}{16}-8\frac{3}{8}=n$
G $\frac{4}{5}-\frac{1}{3}=n$
H $48\frac{1}{2}-11\frac{9}{10}=n$
I $13\frac{3}{5}-12\frac{1}{4}=n$

A $n+2\frac{1}{2}=5$
B $14\frac{2}{3}-n=8\frac{1}{4}$
C $7\frac{3}{8}+n=10\frac{2}{3}$
D $9\frac{5}{8}-2\frac{1}{4}=n$
E $n-3\frac{1}{6}=12\frac{1}{2}$
F $8\frac{7}{10}+1\frac{3}{10}=n$
G $n+1\frac{1}{2}=4\frac{1}{2}$
H $n-2\frac{3}{8}=7$
I $6\frac{7}{12}+n=8\frac{1}{4}$

J $11\frac{1}{5}-8\frac{7}{10}=n$
K $7\frac{3}{8}-n=4$
L $5\frac{11}{12}+\frac{5}{12}=n$
M $n-\frac{9}{10}=1\frac{1}{5}$
N $18\frac{3}{4}+n=21$
O $n+\frac{15}{16}=1\frac{1}{8}$
P $12\frac{7}{12}-n=10\frac{1}{4}$
Q $13+8\frac{2}{3}=n$
R $24\frac{1}{8}-n=16$

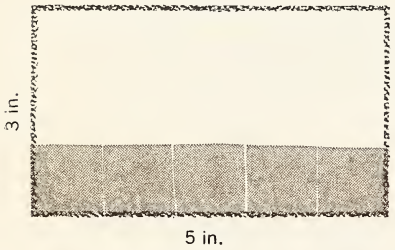
Exploring problems



A A piece of paper is in the shape of a rectangle 3 in. wide and 5 in. long. What is its area in square inches?

Look at the diagram.

Imagine that 1-inch squares are laid in rows to cover the rectangle. There will be 5 of these squares in each row because the base of the rectangle is 5 in. There are 5 square inches in one row.



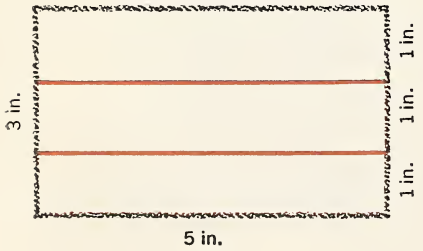
B This is a rate of 5 square inches per row. Write this rate as a ratio.

$$\frac{5}{1}$$

5 ← Number of square inches in each row

1 ← Number of rows

Now you must find how many rows of square inches there will be. The altitude is 3 in., and each row will use 1 in. of the altitude. So there will be 3 rows.

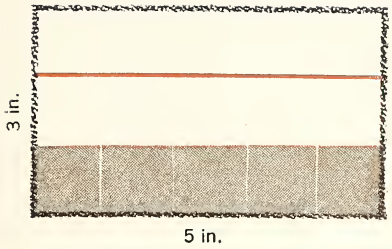


C You do not know how many square inches will be used for the 3 rows, but you do know that they will be used at the rate of 5 square inches per row. You can express the rate as n square inches per 3 rows.

$$\frac{n}{3}$$

n ← Total number of square inches

3 ← Total number of rows



The rate at which square inches will be used will be the same for the 3 rows as for 1 row. Look at the equation.

D

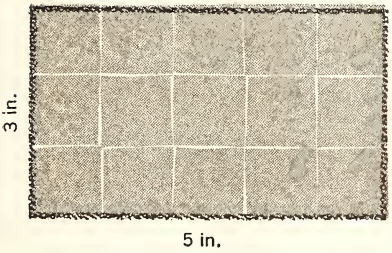
$$\frac{5}{1} = \frac{n}{3}$$

You must find the numeral that replaces n.

---

5 square inches are used for 1 row.
15 square inches are used for all 3 rows.

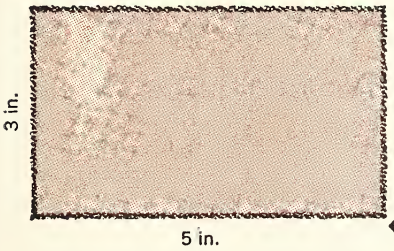
E



$$\frac{5}{1} = \frac{n}{3}$$

3 can be found by multiplying 1 by 3. So the numeral that replaces n can be found by multiplying 5 by 3.
$n = 15$

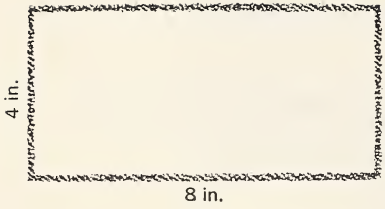
F



$$\frac{5}{1} = \frac{15}{3}$$

The 15 was found by multiplying the 5 by 3. Why was 5 multiplied by 3?

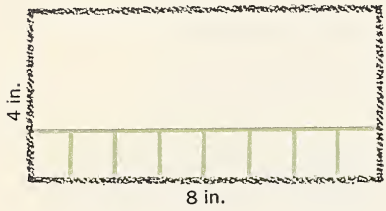
The area of the paper rectangle is 15 square inches.



G A piece of paper is in the shape of a rectangle 4 in. wide and 8 in. long. What is its area in square inches?

← Look at the diagram.

H The base of the rectangle is 8 in. long. So in one row there will be ▒ sq. in. The rate is ▒ square inches per row. Write the rate as a ratio.

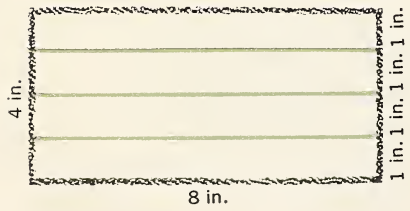


←

$\frac{8}{1}$ ← What does this numeral stand for?

← What does this numeral stand for?

I The altitude of the rectangle is 4 in. So there will be ▒ rows of square inches. Why can the rate also be expressed as n square inches per 4 rows? Write this rate as a ratio.



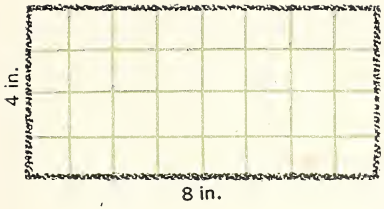
←

$\frac{n}{4}$ ← What will the numeral that replaces n stand for?

← What does this numeral stand for?

Square inches will be used at the same rate for 4 rows as for 1 row.

J



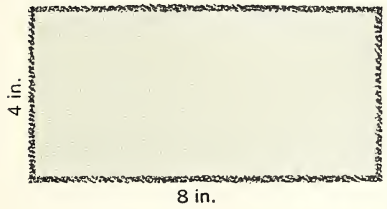
$$\frac{8}{1} = \frac{n}{4}$$

What do the 8 and the n stand for?

What do the 1 and the 4 stand for?

In 4 rows there will be ▒ times as many square inches as in 1 row.

K



$$\frac{8}{1} = \frac{n}{4}$$

Why do you multiply 8 by 4 to find the numeral that replaces n? $n =$ ▒

The area of the paper rectangle is ▒ sq. in.

The base of Square L is 5 in. The altitude is 5 in. Find its area in square inches.

L

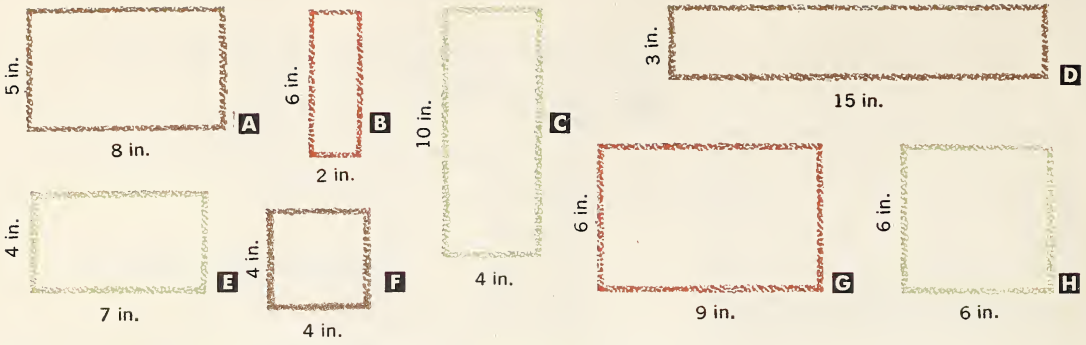
$$\frac{5}{1} = \frac{n}{5}$$

This ratio means ▒ sq. in. per 1 row.

When you have found the numeral that replaces n, you will know how many square inches there are in ▒ rows.

Why do you multiply 5 by 5 to find the numeral that replaces n?

The area of Square L is ▒ sq. in.



Each diagram above represents a piece of board that is a rectangle. Find the area of each piece of board.

A A side of a square piece of glass is 11 in. long. Find the area of the piece of glass in square inches.

THINK The base is ▒ in. long. The altitude is ▒ in. long.

B The pages in a book are 7 in. wide and 9 in. high. Find the area of a page.

THINK The base is 7 in. What is the altitude?

C A piece of drawing paper is 8 in. wide and 11 in. long. What is its area in square inches?

THINK If you use 11 in. for the base, what do you use for the altitude?

D The length of a piece of cardboard is 29 in., and the width is 14 in. What is the area of the piece of cardboard in square inches?

E A table top is 22 in. long and 17 in. wide. Find the area of the table top in square inches.

F A puzzle is a rectangle 12 in. long and 10 in. wide. What is its area in square inches?

G A side of a square piece of glass is 20 in. long. Find its area in square inches.

H A picture is 8 in. square. Find the area of a piece of glass that will cover the picture.

I A piece of glass in a window is 36 in. wide and 13 in. high. What is the area of this piece of glass?

J The width of a page in a magazine is 9 in., and the height is 12 in. What is the area of the page in square inches?

K What is the area of the top of a box that is 26 in. long and 17 in. wide?

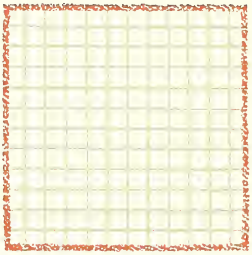
Now you should know how to solve problems about the areas of rectangles.

Moving forward

In this lesson you will learn how to measure area in square feet and square yards.

A

B



C

Diagram A represents a square piece of cardboard. Each side of the square is ▒ ft. The area of the cardboard is 1 square foot. The work below shows how to find the area of the cardboard in square inches.

A Why can you think of each dimension of the cardboard square as 12 in.? Look at Diagram B. If you mark off the cardboard in square inches, there will be ▒ sq. in. in one row. This is a rate of 12 sq. in. per 1 row.

$\frac{12}{1}$ ← What does 12 represent?

← What does 1 represent?

B How do you know that there will be 12 rows? Now the rate can also be expressed as n square inches per 12 rows.

$\frac{n}{12}$ ← What will the numeral that replaces n represent?

← What does this 12 represent?

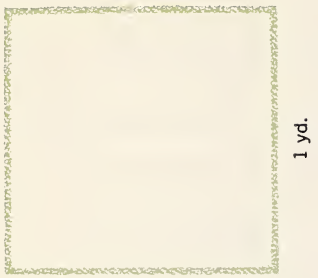
C Look at Diagram C. Square inches will be used at the same rate for 12 rows as for 1 row.

$\frac{12}{1} = \frac{n}{12}$ ← When you find the numeral that replaces n, you will know how many square inches there are in 12 rows.

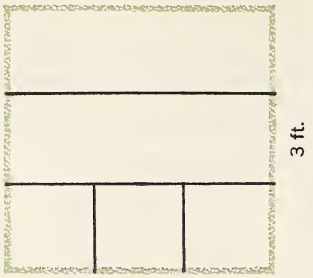
Why do you multiply 12 by 12 to find the numeral that replaces n?

The area of the piece of cardboard is ▒ sq. in.

1 square foot = 144 square inches



D



E

F

Diagram D represents another square of cardboard. The length of each side of this square is 1 yd. The area is 1 square yard. The work below shows how to find the area in square feet.

D Look at Diagram E. In one row there are ▒ sq. ft. The rate is ▒ sq. ft. per 1 row.

E How many rows are there? The rate can be expressed now as n sq. ft. per ▒ rows.

F Now look at Diagram F. Square feet will be used at the same rate for the 3 rows as for 1 row.

$$\frac{3}{1} = \frac{n}{3}$$

When you find the numeral that replaces n, you will know how many square feet there are in 3 rows.

Why do you multiply 3 by 3 to find the numeral that replaces n?

1 square yard = 9 square feet

G Diagram G on page 247 represents a large piece of glass in the shape of a rectangle. Its dimensions are ▒ yd. and ▒ yd. You can express its area as 30 sq. yd. How do you get the 30?

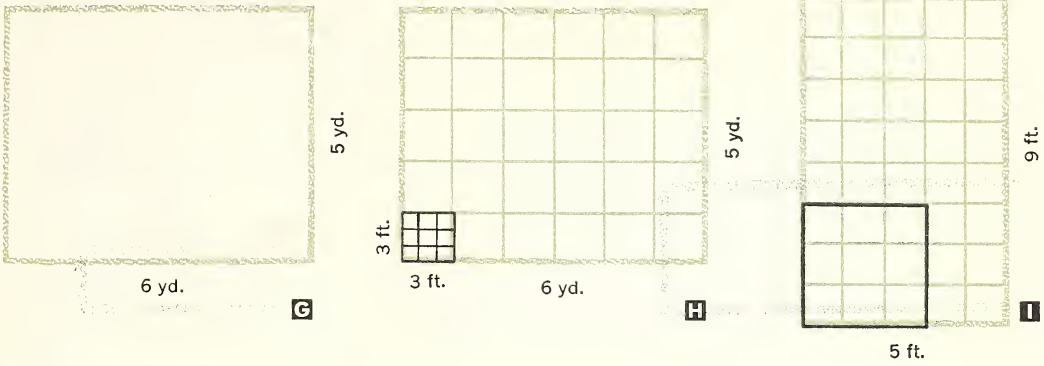
H You can also express the area of the glass in square feet. To do this, change the 30 sq. yd. to square feet.

The rate of square feet per square yards is always the same. The rate of square feet for 1 sq. yd. is expressed as 9 per 1. Look at Diagram H. The rate of square feet for 30 sq. yd. can be expressed as n per 30.

$$\frac{9}{1} = \frac{n}{30}$$

When you find the numeral that replaces n, you will know how many square feet there are in 30 sq. yd.

To find the numeral that replaces n, multiply 9 by ▒. Why do you multiply by 30? 30 sq. yd. = 270 sq. ft.



I A table top is 4 ft. long and 2 ft. wide. Find its area in square feet.

J What is the area in square inches? In 1 sq. ft. there are ▒ sq. in.

$$\frac{144}{1}=\frac{n}{8}$$

Why do you multiply 144 by 8 to find the numeral that replaces n?

K A floor is 63 sq. yd. in area. Find its area in square feet.

$$\frac{9}{1}=\frac{n}{63}$$

What does the 9 represent? What does the 63 represent?

L Diagram I represents a door. The dimensions of the door are ▒ ft. and ▒ ft. The area can be expressed as 45 sq. ft. How do you get the 45?

M You can also express the area of the door in square yards. To do this, change the 45 sq. ft. to square yards. Does 9 per 1 express the rate of square feet per square yards? There are 45 sq. ft. in the door. Does 45 per n also express the rate of square feet per square yards? What does n represent?

$$\frac{9}{1}=\frac{45}{n}$$

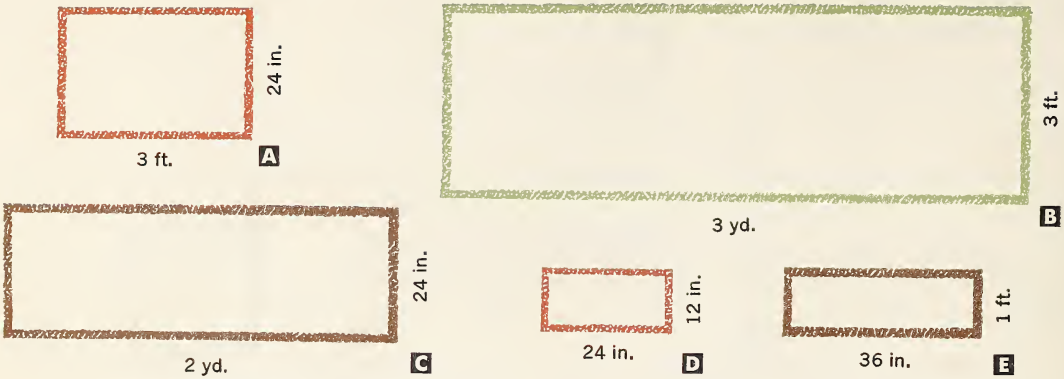
When you find the numeral that replaces n, you will know how many square yards there are in 45 sq. ft.

Why do you multiply 1 by 5 to find the numeral that replaces n?

N A wall is 27 ft. long and 14 ft. high. What is its area in square yards?

$$\frac{9}{1}=\frac{378}{n}$$

What is the area of the wall in square feet? What does the 9 represent? How do you find the numeral that replaces n?



O The dimensions of a picture are 18 in. and 16 in. Find the area of the picture in square feet.

First find the area in square inches. This area is 288 sq. in. How do you get the 288?

Next you change 288 square inches to square feet. ▒ sq. in. will be used for each square foot.

$$\frac{144}{1} = \frac{288}{n}$$

Why do you multiply 1 by 2 to find the numeral that replaces n?

P Look at Diagram A. The length of the base is shown in feet, and the length of the altitude is shown in inches. Find the area in square inches. Change 3 ft. to inches. Then what do you do?

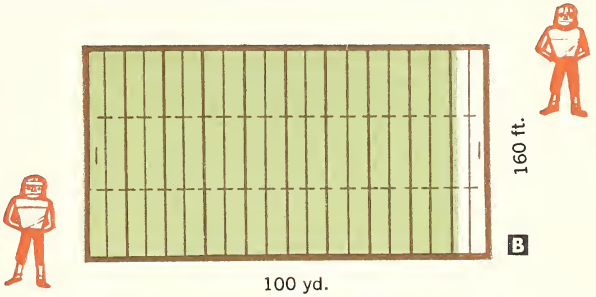
Q You can also find the area of Rectangle A in square feet. To do this, you can change 864 square inches to square feet. Or you can first change 24 in. to feet. Then what do you do?

R Find the area of each of the other rectangles above. You may have to change one dimension before you make your equation.

A 17 sq. ft. = ▒ sq. in.
B 81 sq. ft. = ▒ sq. yd.
C 432 sq. in. = ▒ sq. ft.
D 11 sq. yd. = ▒ sq. ft.
E 720 sq. in. = ▒ sq. ft.
F 8 sq. ft. = ▒ sq. in.
G 126 sq. ft. = ▒ sq. yd.
H 18 sq. yd. = ▒ sq. ft.
I 171 sq. ft. = ▒ sq. yd.
J 13 sq. ft. = ▒ sq. in.

Now you know how to measure areas in square inches, square feet, and square yards and how to change square measures when you need to.

Using arithmetic



A Diagram A represents a square piece of land. Each side of the square is ▒ ft. long. Find its area.

B Land is usually measured in acres. An acre is 43,560 sq. ft. Is the piece of land in Diagram A more than or less than 1 acre? Should you say that it is approximately 1 acre?

C Diagram B represents the playing part of a football field. How long is it? How wide is it? What is its area?

D "A." is the abbreviation for "acre." The area of the football field is ▒ sq. ft. more than 1 A.

E The part of the playing field that is green in the picture is 272 ft. long. How wide is it? Is the green part approximately 1 acre? It is how much more or how much less than 1 acre?

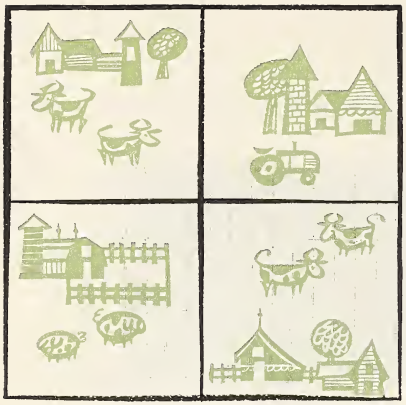
F Mr. West is building a house on a lot that is 75 ft. wide and 180 ft. long. Would 3 lots of this size be about 1 A.?

G Find the approximate dimensions of your school yard. What is its approximate area? Is it more or less than 1 acre? It is about how much more or less than 1 acre?

H Each block in one large city is a square that is 660 ft. on a side. What is the area of each block?

I How many square feet are there in 10 A.? Is the city block described in Problem H more than, less than, or exactly 10 A.?

J Find the perimeter of the city block in Problem H. Is the perimeter more than or less than 1 mi.? It is how much more than or less than 1 mi.?



C

1 square mile = 640 acres

K Diagram C represents a square piece of land. Each side is ▒ mi. long. The area of this piece of land is ▒ sq. mi., or ▒ A.

L A square mile of land may also be called a section. How many acres are in a section?

M The 4 farms shown on Diagram C are equal in size. How many acres are there in each farm?

N Find the perimeter of the section of land in Diagram C.

O A large farm is in the shape of a rectangle 3 mi. long and 2 mi. wide. Find the area of the farm in acres.

The dimensions of five fields that are in the shape of rectangles are given below. Find the area of each field. Is the area of each field more than or less than 1 acre?

A 325 ft. long; 180 ft. wide
B 260 ft. long; 170 ft. wide
C 200 yd. long; 70 ft. wide
D 70 yd. long; 29 yd. wide
E 112 yd. long; 150 ft. wide

Thinking straight

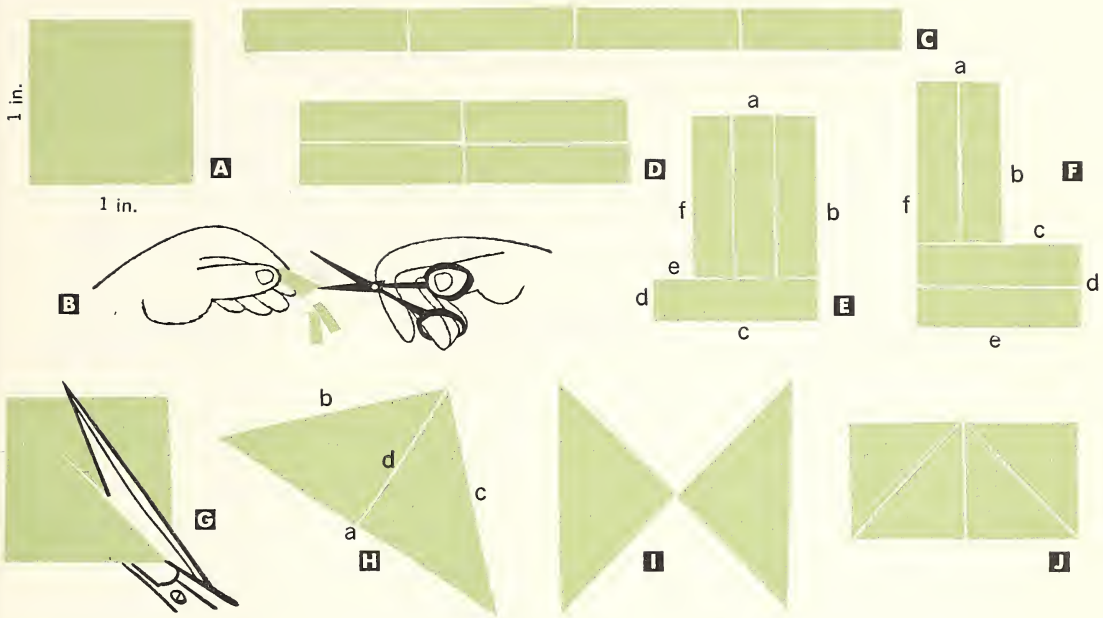
A Picture A on page 251 shows a square whose sides are 1 inch in length. What is the area of this square?

B In Picture B, the inch square is being cut into four strips that are equal in width. What will be the dimensions of each strip?

C Is the total area of the four strips 1 sq. in.? How do you know?

D In Picture C the strips from Picture B have been arranged to form a polygon. What kind of polygon is this? Is the area of Polygon C the same as the area of Square A? What are the dimensions of Polygon C?

E What kind of polygon do the strips form in Picture D? What is the area of Polygon D? What are the dimensions of this polygon?



F In Picture E the strips have been arranged in another way. How many sides does this polygon have? Is the area still 1 sq. in.? What is the length of each side of this polygon?

G How many sides has Polygon F? What is its area? What is the length of each side?

H Picture G shows an inch square that is being cut into halves. What kind of polygon will each half be?

I The polygon in Picture H has been formed from the two pieces shown in Picture G. What kind of polygon is it? What is its area? How long is side a? Can you tell how long sides b and c are without measuring them? Line d is the altitude. What is its length?

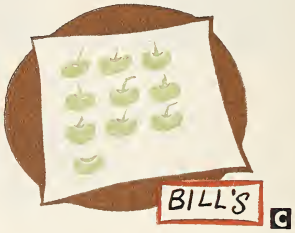
J Polygon I has also been formed from the two pieces of the inch square in Picture G. How many sides does Polygon I have? What is its area? What is the area of each triangle?

K Polygon J was formed by putting together 4 equal triangles. These triangles were made by cutting the two triangles in Polygon I into halves. What is the area of Polygon J?

L Can a triangle have an area of 1 sq. in.? Can two rectangles that do not have the same dimensions each have an area of 1 sq. in.?

Moving forward

Now you will study a new way to express rates.



A Look at the pictures above. Each boy had how many beans? How many of each boy's beans sprouted?

B Which boy had the most sprouted beans? Which boy had the fewest?

C You can show the rate at which each boy's beans sprouted by writing a ratio. Look at Column A below. What is the rate for John's beans? For Paul's beans? For Bill's beans?

D To find which boy had beans that sprouted at the highest rate, you can express each rate with a ratio that shows how many per 100. Look at Column B. What is the rate per 100 for John's beans? For Paul's beans? For Bill's beans?

E How does Column B help you decide that Bill's beans sprouted at the highest rate? Which boy had beans that sprouted at the lowest rate?

F Column C shows how to read the ratios that express how many per 100. Read these ratios.

G Column D shows another way to say each rate. When a rate is expressed as so many per 100, the rate is called a per cent. Per cent means per hundred. What per cent of each boy's beans sprouted?

	A	B	C	D	E
John	$\frac{18}{25}$	$\frac{72}{100}$	72 per 100	72 per cent	72%
Paul	$\frac{15}{20}$	$\frac{75}{100}$	75 per 100	75 per cent	75%
Bill	$\frac{9}{10}$	$\frac{90}{100}$	90 per 100	90 per cent	90%

H The sign at the right is called the per cent sign. You read it "per cent." Column E on page 252 shows how to write the ratios with the per cent sign. Which boy had the highest per cent of sprouted beans? Which boy had the lowest per cent?

Write each of the ratios below, using the per cent sign.

A $\frac{25}{100}$ B $\frac{14}{100}$ C $\frac{3}{100}$ D $\frac{99}{100}$

Write each of the following as a ratio without using the per cent sign.

E 16% F 2% G 86% H 39%

For each rate given at the top of the next column, write one or more equal ratios without using the per cent sign. The work you might write for 50% is shown below.

A $50\% = \frac{50}{100} = \frac{25}{50} = \frac{5}{10} = \frac{1}{2}$.

A 50% D 44% G 12% J 80%
B 18% E 75% H 60% K 90%
C 25% F 40% I 35% L 65%

M Jim said that he spelled 90% of the words in a test correctly. Do you know how many words were in the test? Do you know how many words he missed?

N Did there have to be 100 words in the test? Could there have been 50 words? Could there have been 10?

O Can you say that Jim spelled 9 out of 10 words correctly?

Express the ratios below as per cents, and for each pair decide which ratio shows the higher rate.

A $\frac{2}{4}, \frac{3}{5}$ D $\frac{1}{2}, \frac{3}{5}$ G $\frac{7}{25}, \frac{9}{10}$

B $\frac{2}{5}, \frac{3}{4}$ E $\frac{3}{20}, \frac{4}{25}$ H $\frac{11}{20}, \frac{19}{50}$

C $\frac{1}{2}, \frac{3}{10}$ F $\frac{7}{10}, \frac{3}{4}$ I $\frac{19}{20}, \frac{16}{25}$

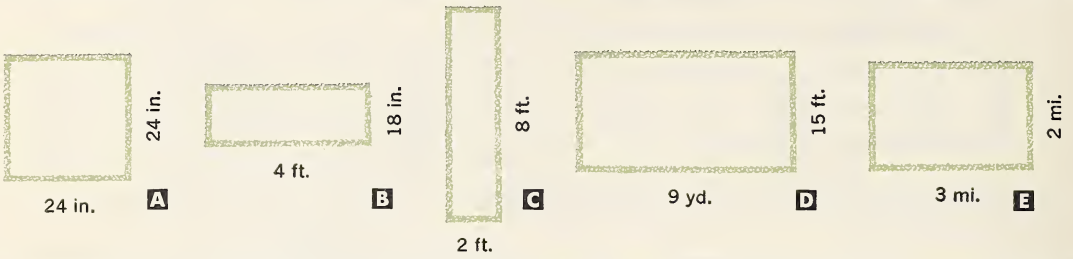
Now you should understand that a per cent is a way of expressing a rate so that it shows how many per 100.

Keeping skillful

A $n + 11\frac{7}{8} = 16\frac{1}{4}$
B $13\frac{2}{3} - 12\frac{2}{3} = n$
C $8\frac{7}{10} + n = 11$
D $60\frac{1}{4} + 19\frac{5}{6} = n$
E $n - 44 = 80\frac{1}{2}$
F $18 - n = 12\frac{1}{2}$
G $46\frac{9}{10} - 28\frac{5}{6} = n$
H $11\frac{5}{8} + 33\frac{5}{6} = n$
I $27 + n = 35\frac{4}{5}$
J $60\frac{1}{6} - n = 48\frac{7}{8}$
K $n + 14\frac{2}{3} = 41$
L $n - 14\frac{2}{3} = 41$

A $1\frac{5}{8} + 7\frac{3}{4} + \frac{11}{12} = n$
B $4\frac{3}{4} + \frac{7}{12} + 5\frac{5}{6} = n$
C $8\frac{1}{5} + 1\frac{7}{10} + 3\frac{3}{4} = n$
D $9\frac{1}{2} + 10 + 3\frac{1}{2} = n$
E $6\frac{2}{3} + \frac{7}{12} + 4\frac{1}{6} = n$
F $5\frac{3}{8} + 6\frac{1}{2} + 5\frac{1}{6} = n$

Checking up



Test 1

Find the area of each rectangle above.

Test 2

Find the area of each rectangle whose dimensions are given below.

- A base, 21 in.; altitude, 14 in.
- B 15 ft. square
- C 27 ft. long; 5 yd. wide
- D 8 mi. square
- E 66 in. long; 2 ft. high
- F depth, 36 yd.; width, 75 ft.

Test 3

- A 7 sq. ft. = ▒ sq. in.
- B 36 sq. ft. = ▒ sq. yd.
- C 576 sq. in. = ▒ sq. ft.
- D 3 sq. mi. = ▒ A.
- E 8 sq. yd. = ▒ sq. ft.
- F 1920 A. = ▒ sq. mi.
- G 7 sq. mi. = ▒ A.
- H 720 sq. in. = ▒ sq. ft.
- I 11 sq. yd. = ▒ sq. ft.
- J 126 sq. ft. = ▒ sq. yd.
- K 12 sq. ft. = ▒ sq. in.

Keeping skillful

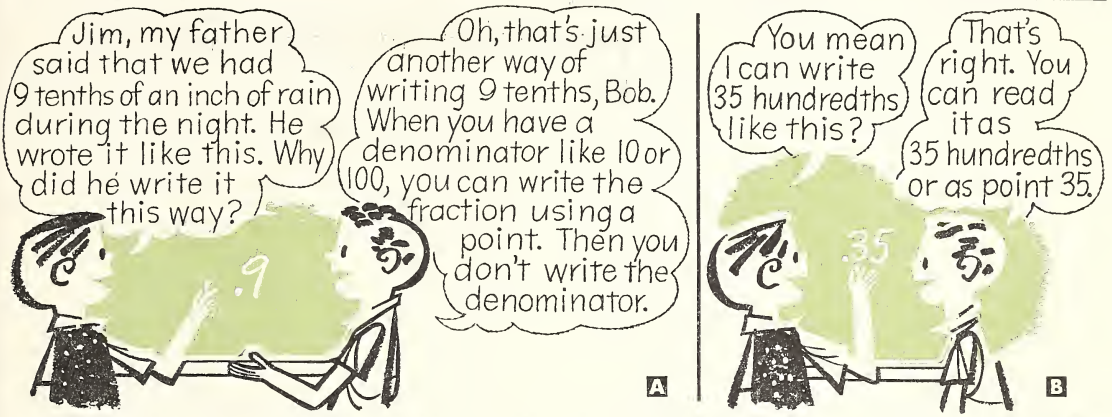
- A $12\frac{1}{4} - n = 8\frac{1}{2}$
- B $46\frac{3}{10} + 17\frac{7}{10} = n$
- C $10\frac{5}{6} - 1\frac{5}{6} = n$
- D $n + 7\frac{7}{8} = 15\frac{11}{12}$
- E $21\frac{3}{4} + n = 28$
- F $n - 5\frac{1}{2} = 13$
- G $\frac{4}{5} + \frac{3}{10} + \frac{4}{5} + \frac{1}{10} = n$
- H $15\frac{7}{16} - 4\frac{3}{4} = n$

- A $5634 \div 66 = n$
- B $7446 \div n = 438$
- C $28022 \div 89 = n$
- D $28896 \div n = 48$
- E $344032 \div 416 = n$
- F $8265 \div n = 95$
- G $7025 \div 110 = n$
- H $5396 \div 847 = n$
- I $5194 \div n = 98$

- A $46381 + 5046 = n$
- B $68 \times 3187 = n$
- C $2504 \div 72 = n$
- D $17006 - 9348 = n$
- E $230 \times 917 = n$
- F $80001 - 68423 = n$
- G $35850 \div 717 = n$
- H $74 + 19 + 23 + 40 = n$
- I $60 \times 2463 = n$

Moving forward

In this lesson you will learn a different way to write fraction numerals.


Jim, my father said that we had 9 tenths of an inch of rain during the night. He wrote it like this. Why did he write it this way?
.9
Oh, that's just another way of writing 9 tenths, Bob. When you have a denominator like 10 or 100, you can write the fraction using a point. Then you don't write the denominator.
A
You mean I can write 35 hundredths like this?
.35
That's right. You can read it as 35 hundredths or as point 35.
B

$\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$

.2 .20

C

$\frac{3}{4} = \frac{75}{100}$

.75

D

$\frac{2}{25} = \frac{8}{100}$

.08

E

A Fraction numerals written in the way that Jim explained are called decimal fraction numerals. Where have you seen decimal fraction numerals used?

B Do the three black numerals under Picture C express the fraction of the rectangle that is green? The green numerals show how to write $\frac{2}{10}$ and $\frac{20}{100}$ as decimal fraction numerals. You read them in the same way you read the numerals above them.

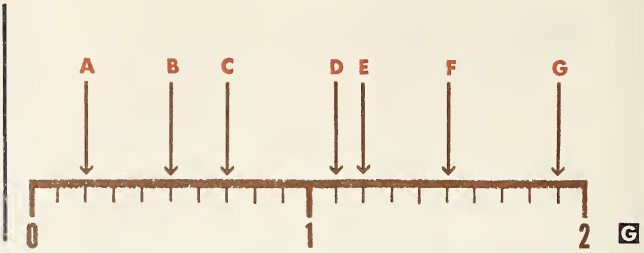
C Some fraction numerals can be changed to hundredths but not to tenths. Look at Picture D. Do both the black and the green numerals express the fraction of the circle that is green?

D Look at Picture E. What do the black numerals under the rectangle express? Look at the green numeral. This shows how to write $\frac{8}{100}$ as a decimal fraction numeral. The 0 between the point and the 8 shows that the decimal fraction numeral means hundredths, not tenths. How do you read .08? How do you read .8? How do you read .80?

$1\frac{2}{5} = 1\frac{4}{10} = 1\frac{40}{100}$

1.4 1.40

F



G

E Look at Picture F. Does each of the black numerals tell how much of the two circles is red? The green numerals show how to write $1\frac{4}{10}$ and $1\frac{40}{100}$ using decimal fraction numerals. To read the first green numeral, say "1 and 4 tenths." Read the second numeral.

F Picture G shows a number line. The marks between 0 and 1 divide this part of the number line into tenths. You can write the fraction numerals $\frac{2}{10}$, .2, or $\frac{1}{5}$ for Mark A. Now write two or more different fraction numerals for Mark B. For Mark C.

G The marks between 1 and 2 divide this part of the number line into tenths. For Mark D, you can write either the numeral $1\frac{1}{10}$ or 1.1. For Mark E, you can write $1\frac{1}{5}$, or $1\frac{2}{10}$, or 1.2. What decimal fraction numeral can you write for Mark F? For Mark G?

H Which is longer, .1 in. or .2 in.?

I Which is longer, .01 in. or .02 in.?

J Which is longer, .1 in. or .01 in.?

K Which is longer, .1 in. or .11 in.?

Read each numeral below.

A	.3	**E**	.1	**I**	6.7	**M**	9.04
B	.06	**F**	2.6	**J**	.18	**N**	.75
C	5.4	**G**	.9	**K**	.01	**O**	2.36
D	.2	**H**	.88	**L**	4.63	**P**	.07

Write each of the numerals below as a decimal fraction numeral.

A	$3\frac{1}{2}$	**E**	$\frac{35}{100}$	**I**	$\frac{1}{50}$	**M**	$1\frac{3}{50}$
B	$\frac{12}{25}$	**F**	$\frac{13}{20}$	**J**	$3\frac{2}{5}$	**N**	$\frac{9}{10}$
C	$\frac{1}{4}$	**G**	$2\frac{9}{10}$	**K**	$\frac{19}{20}$	**O**	$2\frac{7}{25}$
D	$98\frac{3}{5}$	**H**	$6\frac{3}{4}$	**L**	$16\frac{2}{25}$	**P**	$3\frac{4}{5}$

Write each numeral below without using a decimal fraction numeral. Be sure to show the simplest form. The first two examples are done for you.

A	$.16 = \frac{16}{100} = \frac{4}{25}$	**G**	.55	**K**	3.02
B	$3.8 = 3\frac{8}{10} = 3\frac{4}{5}$	**H**	10.09	**L**	.60
C	.35	**E**	7.75	**I**	4.36	**M**	1.5
D	1.4	**F**	.06	**J**	.9	**N**	7.99

Now you know that decimal fraction numerals are another way of writing certain fraction numerals.

Using arithmetic

A Tony and Paul have been reading about railroads in the United States. Today the average freight car carries about 54 T. of freight. The average freight car of 25 years ago carried about 46 T. The freight car of today carries about how many more pounds than the freight car of 25 years ago?

B In 1954, United States railroads used 37,251 locomotives. In 1940, they used 41,721 locomotives. They used how many fewer locomotives in 1954 than in 1940?

C Passenger and freight locomotives of today differ in weight from about 70 tons to about 420 tons. The heaviest locomotive in use today weighs about how many times as much as the lightest locomotive?

D One locomotive used in the United States 100 years ago weighed 6 T. One of the lightest locomotives in use today weighs 12 times as much as this old one. How much does this new light locomotive weigh?

E There are 790,144 mi. of railroad in the world. 221,098 mi. are in the United States. There are how many miles of railroad in the rest of the world?

F In 1845, before mail was carried by the railroads, it cost 75¢ to send a 3-page letter from Boston to Washington, D.C. In 1957, it cost 3¢. It cost how many times as much to send a letter from Boston to Washington in 1845 as it did in 1957?

G The longest railway bridge in the United States crosses Great Salt Lake. The bridge is 12 miles long. How many feet long is the bridge?

H The distance between the parallel rails of a standard railroad track is $56\frac{1}{2}$ in. On a few short railroads in the United States the distance between the rails is 3 ft. These 3-foot tracks are how many inches narrower than the standard tracks?

I A train traveled 6 mi. in 5 min. How many miles per hour was this train traveling?

THINK 1 hr. = 60 min.

J Today a freight train travels an average distance of about 19 miles in an hour. About how far can a freight train travel in 8 hours?

K Tony's father has a model railroad. Last year he spent $156 on his hobby. He spent an average of how much per week?

L Last year Tony's father spent twice as much money on his model railroad as Paul's father did on his. How much did Paul's father spend on his model railroad last year?

M Tony helps his father with the model railroad for about 4 hours every week. Tony spends about how many hours in a year helping with the model railroad?

N Paul's father now has 55 feet of track for his model railroad. He hopes to have 4 times as much track some day. How many feet of track does he hope to have?

O The table below shows the average amount a railroad spends for new equipment for a passenger train. What is the total cost of 1 mail car, 1 coach, 1 baggage car, and 1 club car?

Locomotive	$500,000
Mail car	45,616
Baggage car	46,646
Coach	110,423
Sleeping car	149,776
Club car	173,267
Dining car	145,289

P Find the total cost of a new train that is made up of a locomotive, a mail car, a baggage car, 4 coaches, 5 sleeping cars, a dining car, and a club car.

Keeping skillful

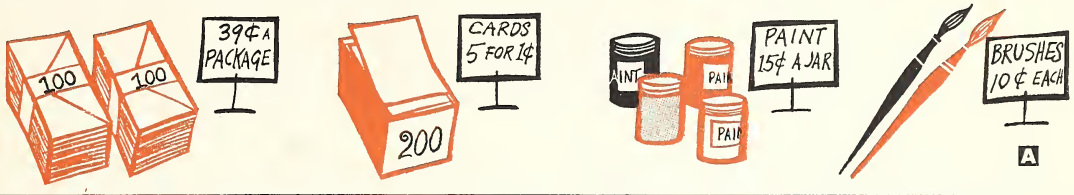
Find the sum.

A 37, 60, 41, 29, 16
B 8, 55, 34, 9, 28
C 205, 83, 118, 632
D 65, 90, 7, 53, 86
E 451, 205, 718, 964
F 3395, 820, 6471
G 86, 470, 518, 62
H 119, 383, 736, 525
I 229, 641, 802, 167
J 955, 387, 226, 794
K 620, 4008, 2917, 933
L 9207, 439, 5083
M 8375, 991, 2346, 78

A $7006 - 4389 = n$
B $2504 \div 7 = n$
C $9 \times 5436 = n$
D $94252 - 8806 = n$
E $64 \times 510 = n$
F $725 \div 23 = n$
G $n + 30041 = 50020$
H $1710 \div n = 45$
I $n \times 52 = 3640$
J $n - 8337 = 5949$
K $764 \times 308 = n$
L $205 \times n = 11685$
M $12475 - n = 7868$
N $96 \times 2089 = n$

A 63 sq. ft. = ▭ sq. yd.
B 3 sq. ft. = ▭ sq. in.
C 10 sq. yd. = ▭ sq. ft.
D 108 sq. ft. = ▭ sq. yd.
E 24 sq. yd. = ▭ sq. ft.
F 6 sq. mi. = ▭ A.
G 1152 sq. in. = ▭ sq. ft.
H 12 sq. yd. = ▭ sq. ft.
I 36 sq. yd. = ▭ sq. ft.
J 2560 A. = ▭ sq. mi.
K 41 sq. ft. = ▭ sq. in.
L 1296 sq. ft. = ▭ sq. yd.
M 20 sq. mi. = ▭ A.
N 3888 sq. ft. = ▭ sq. yd.

Thinking straight



A

B

C

D

A Picture A shows the materials Carol and Ann used to make 200 birthday cards to sell at the school fair. How much did all of these materials cost?

B The girls wanted to sell the cards for enough money to have a profit of $5.00. For how much would they have had to sell all the cards?

C Look at Picture B. Would Carol's plan have brought in enough money?

THINK She planned to sell the cards at the rate of 10 per 35¢, or 200 per n. Write the equation.

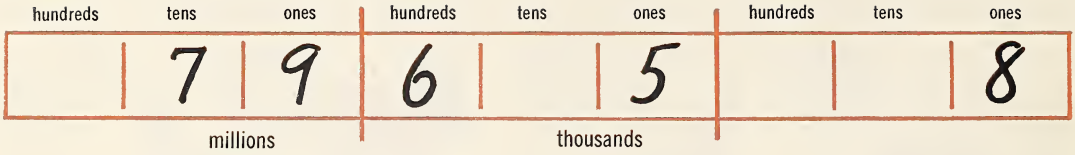
D Look at Picture C. Would Ann's plan have brought in enough money?

THINK Ann planned to sell the cards at the rate of 1 per 4¢, or 200 per n.

E Look at Picture D. If they had sold all the cards by either plan, would they have had the profit they wanted? Explain your answer.

F The girls sold 100 cards at the rate of 10 cards for 35¢ and 90 cards for 4¢ each. Did they make a profit of $5.00?

Looking back



The table above has space for only one large numeral. Make a table like this one, but allow space for eight numerals. Write the numerals below in your table.

- **A** 79,605,008
- **B** 33,600
- **C** 427,001,955
- **D** 1,963,017
- **E** 804,126
- **F** 15,000,742
- **G** 633,984,182
- **H** 48,000,000

Write with numerals.

- **A** five hundred eighty thousand twelve
- **B** seventeen million twenty-three thousand six hundred ninety
- **C** one hundred million thirty-six
- **D** one hundred forty-four million one thousand
- **E** four hundred ten thousand five

Round off the numbers below. The first example has been done for you.

		Higher hundred thousand	Lower hundred thousand	Nearer million
A	38,482,710	38,500,000	38,400,000	38,000,000
B	196,832,336			
C	9,531,875			
D	3,137,424			
E	499,701,300			
F	1,895,369			

Read.

- **A** .9
- **B** .18
- **C** 2.05
- **D** .67
- **E** 30.3
- **F** 47.30
- **G** .02

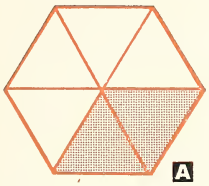
Write as decimal fraction numerals.

- **A** sixteen hundredths
- **B** four and seven tenths
- **C** eight-six hundredths
- **D** four tenths
- **E** two and one hundredth
- **F** one tenth
- **G** twenty hundredths

Write the numerals below using fraction numerals without the decimal point. Write them in simplest form.

- **A** .6
- **B** 6.48
- **C** .03
- **D** .5
- **E** 3.75
- **F** .80
- **G** 5.33
- **H** .01
- **I** 7.1
- **J** .9
- **K** .15
- **L** 4.2

Looking back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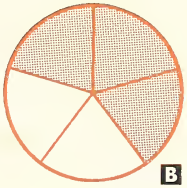
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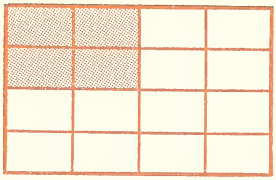
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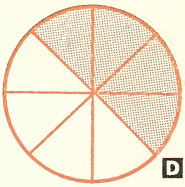
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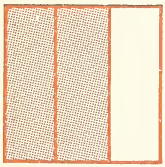
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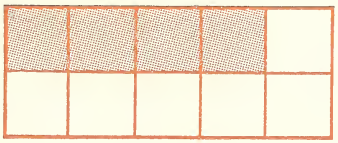
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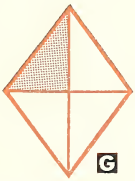
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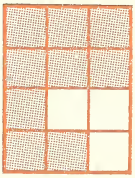

H

Look at Diagram A. You can use either $\frac{2}{6}$ or $\frac{1}{3}$ to tell what fraction of the diagram is red. Use as many fraction numerals as you can to tell what fraction of each of the other diagrams is red.

Read.

A $6\frac{5}{8}$ C $16\frac{3}{4}$ E $\frac{11}{12}$ G $\frac{13}{10}$ I $\frac{15}{10}$

B $\frac{9}{16}$ D $\frac{5}{7}$ F $9\frac{7}{9}$ H $19\frac{7}{15}$ J $\frac{40}{5}$

Write as mixed numbers.

A $\frac{20}{6}$ H $\frac{13}{4}$ O $\frac{19}{16}$

B $\frac{4}{3}$ I $\frac{6}{5}$ P $\frac{28}{12}$

C $\frac{18}{8}$ J $\frac{11}{3}$ Q $\frac{11}{2}$

D $\frac{29}{5}$ K $\frac{30}{12}$ R $\frac{17}{10}$

E $\frac{18}{16}$ L $\frac{13}{6}$ S $\frac{31}{6}$

F $\frac{7}{2}$ M $\frac{9}{4}$ T $\frac{18}{5}$

G $\frac{39}{10}$ N $\frac{23}{8}$ U $\frac{26}{4}$

A $\frac{4}{5} = \frac{\square}{20}$

B $\frac{11}{12} = \frac{22}{\square}$

C $\frac{1}{3} = \frac{\square}{27}$

D $\frac{7}{8} = \frac{\square}{16}$

E $\frac{1}{4} = \frac{7}{\square}$

F $\frac{1}{2} = \frac{9}{\square}$

G $\frac{5}{6} = \frac{\square}{30}$

H $\frac{9}{10} = \frac{18}{\square}$

Write with numerals.

A two and four fifths

B seventeen and one third

C eighteen sevenths

D five and three fifths

E eleven thirds

F six and five eighths

G twenty-nine twelfths

H fifteen and one ninth

Write in order of size. Begin with the largest fraction.

A $\frac{2}{3}, \frac{7}{8}, \frac{3}{4}$

B $\frac{1}{2}, \frac{5}{6}, \frac{2}{5}$

C $\frac{11}{16}, \frac{3}{8}, \frac{3}{4}$

D $\frac{1}{3}, \frac{5}{6}, \frac{7}{12}$

E $\frac{3}{5}, \frac{1}{3}, \frac{3}{10}$

F $\frac{5}{8}, \frac{2}{3}, \frac{5}{6}$

G $\frac{4}{5}, \frac{9}{10}, \frac{5}{6}$

H $\frac{5}{12}, \frac{3}{8}, \frac{1}{3}$

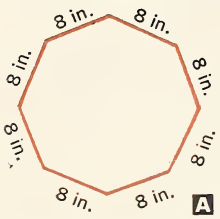
I $\frac{1}{2}, \frac{2}{3}, \frac{3}{5}$

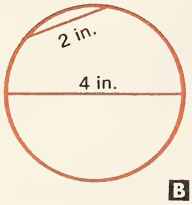
J $\frac{9}{16}, \frac{5}{8}, \frac{3}{4}$

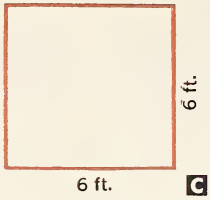
K $\frac{1}{6}, \frac{5}{12}, \frac{1}{3}$

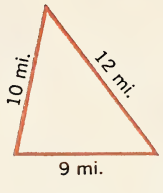
L $\frac{3}{5}, \frac{7}{10}, \frac{3}{4}$

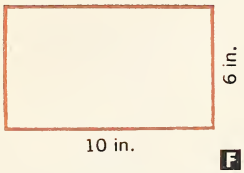
Looking back

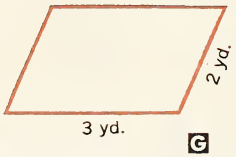


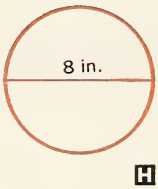


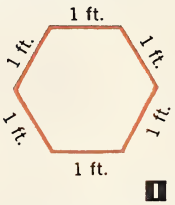


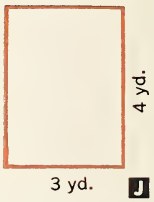












A Look at Pictures A to J. Which of the polygons are rectangles? Are there any triangles? Are there any squares? How many circles are there?

B Find the perimeter of Polygon A.

C Is the perimeter of Polygon C less than or greater than the perimeter of Polygon J?

D Find the perimeter of Polygon D.

E Is the perimeter of Polygon I less than or greater than the perimeter of Polygon A?

F What is the perimeter of Polygon G? How many feet is this?

G What is the length of the diameter in Circle B?

H Find the area of Polygon C.

I Find the area of Polygon F.

J Is the area of Polygon F greater than or less than one square foot?

K Find the area of Polygon J. How many square feet is this? Is the area of Polygon J greater than or less than the area of Polygon C?

A 12 sq. yd. = ▒ sq. ft.

B ▒ sq. in. = 4 sq. ft.

C 72 sq. ft. = ▒ sq. yd.

D 864 sq. in. = ▒ sq. ft.

E 12 sq. ft. = ▒ sq. in.

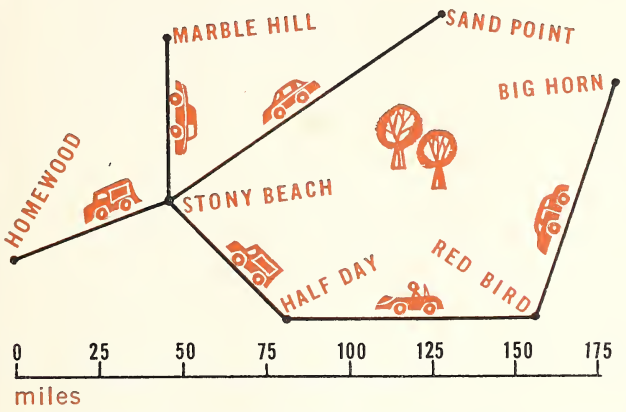
F ▒ sq. yd. = 108 sq. ft.

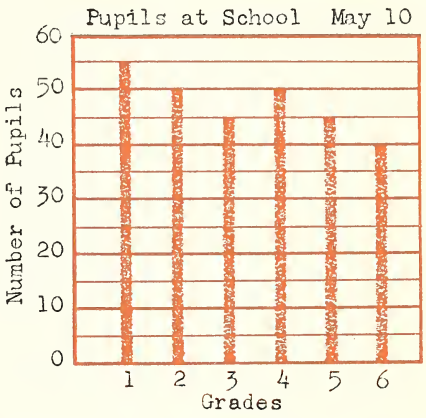
G 9600 A. = ▒ sq. mi.

H 5 sq. mi. = ▒ A.

I 1 sq. yd. = ▒ sq. in.

Looking back





A Use the scale to find the distance between Sand Point and Stony Beach on the map. How many miles is it?

B How many miles is it from Half Day to Marble Hill?

C If you drive at the rate of 30 mi. per hour, about how many hours will it take to drive from Half Day to Big Horn?

D It takes Mr. Stone 5 hours to drive from Red Bird to Homewood when he averages 35 mi. per hour. About how far is it from Red Bird to Homewood? Now measure the distance on the map.

E Look at the bar graph. What do the numerals on the scale at the left of the graph represent? Which grade had the most pupils at school on May 10? Which grade had the fewest?

F There were how many more pupils in the second grade than in the third?

G Which grades had the same number of pupils at school that day?

Write sentences using the ratios below. For Exercise A you might write:
6 apples cost 25¢.
John has 6 books to Bill's 25 books.

A	$\frac{6}{25}$	**C**	$\frac{18}{26}$	**E**	$\frac{6}{15}$	**G**	$\frac{5}{27}$
B	$\frac{3}{5}$	**D**	$\frac{2}{25}$	**F**	$\frac{12}{27}$	**H**	$\frac{9}{15}$

Read.	Write with numerals.
A 35%	**A** eighty-seven per cent
B 1%	**B** three per cent
C 96%	**C** thirty per cent
D 10%	**D** twelve per cent
E 42%	**E** twenty-one per cent

Checking up

Test 1

A A parking lot has 13 rows for cars. Each row holds 28 cars. How many cars are in the lot when all the rows are filled?

B Mrs. Long bought $7.89 worth of groceries. She paid for the groceries with a $20 bill. How much money should she have received in change?

C Sue lives $4\frac{9}{10}$ mi. from the lake. One day she rode the bus part of the way to the lake. Then she walked the rest of the way. She walked $1\frac{1}{10}$ mi. How far did she ride on the bus before she started to walk to the lake?

D Mrs. Long used $2\frac{1}{4}$ c. of flour for a cake, $3\frac{1}{2}$ c. of flour for bread, and $1\frac{1}{2}$ c. of flour for coffee cake. How much flour did she use in all?

E John had 84 papers to deliver one morning. He delivered some and then counted the papers he had left. There were 16 papers left. How many papers had he delivered?

F When Jim's father measured him, he said, "You are exactly 53 in. tall. You have grown $1\frac{3}{4}$ in. since your birthday." How tall was Jim on his birthday?

G A grocer sold $1\frac{7}{8}$ lb. from a whole cheese. Then $3\frac{1}{4}$ lb. of the cheese were left. How much had the whole cheese weighed?

H Sue paid $2.75 for some party favors. They cost 25¢ apiece. How many party favors did she buy?

I Mrs. Case paid $2.94 to mail 21 small packages that were all the same weight. How much did it cost to mail each package?

J The skates that Don wants to buy cost $17.95. He has saved $9.30. How much more money does he need before he can buy the skates?

K Don and Bob collect shells. Don has 110 shells, and Bob has 83 shells. Bob has how many fewer shells than Don?

L Mary's room is $11\frac{1}{4}$ ft. wide, and Sue's room is $10\frac{1}{2}$ ft. wide. What is the difference in the widths of the two rooms?

M Mary needs 100 ft. of crepe paper for decorations. She has about $28\frac{1}{2}$ ft. About how much more crepe paper does she need?

Test 2

A One week Carol worked for $1\frac{1}{2}$ hr. on Monday, $\frac{1}{2}$ hr. on Tuesday, $\frac{3}{4}$ hr. on Wednesday, $1\frac{1}{4}$ hr. on Thursday, and 1 hr. on Friday. She worked an average of how many hours a day?

B At the store one day, Mrs. West bought a 4-lb. chicken at 59¢ a pound, 2 lb. of ground meat at 49¢ a pound, and 3 lb. of other meat at 55¢ a pound. How much did she have to pay for all this meat?

C Two small planes left at the same time to go from Redstone to Casetown, a distance of 300 mi. One plane was traveling 150 miles per hour. The other was traveling 135 miles per hour. How far had the slower plane gone when the faster plane had arrived at Casetown?

D Jim's father weighs 186 lb., and Jim weighs 62 lb. Jim's father weighs how many times as much as Jim?

E Tom and his friends went on a 10-mi. bicycle trip. They rode the first 2 mi. in 20 min. If they kept riding at this rate, how long should the 10-mi. trip have taken?

F On Monday Don practiced playing his cornet for 1 hr. Pat practiced playing his cornet for only 15 min. Don practiced how many times as long as Pat that day?

G Sue bought 20 three-cent stamps, a box of paper and envelopes for $1.25, and a pen for 79¢. How much did she pay for all these things?

H The snowfall for 6 years in one town was 16 in., 17 in., 16 in., 15 in., 20 in., and 18 in. What was the average snowfall?

I Nancy and Ann collect postcards. When Nancy counted hers, she found she had 96. Ann said, "I have 4 times as many postcards as you do." How many postcards did Ann have?

J Mrs. Case paid $1.45 for soap that was on sale at 3 cakes for 29¢. How many cakes of soap did she buy?

K Mrs. Miner uses 24 oranges each week, and Mrs. Parks uses 20 oranges each week. How many oranges will Mrs. Miner use during the time that Mrs. Parks uses 5 oranges?

L Tom worked in his father's store for 2 days. He worked $2\frac{3}{4}$ hr. the first day and $3\frac{1}{4}$ hr. the second day. His father paid him 50¢ an hour. How much did Tom earn in the two days?

M When grapefruit was selling at 3 for 25¢, Mrs. Parks bought 1 dozen grapefruit. How much did she have to pay for the grapefruit?

Test 3

A If you add 2 numbers, will the sum be larger than each of the numbers?

B Can the difference of 2 numbers be larger than each of the numbers?

C Is there a limit to how large a number can be? How do you know?

D Do all rectangles with the same perimeter have the same area?

E Does 1 square foot have to be 1 foot square? How do you know?

F Do all distances of 1 inch on the same map represent the same real distance?

G Can 1 inch on one map represent a longer distance than 1 inch on another map? Why?

Test 4

Find the sum.

A 4821, 1719, 202, 394
B 653, 9160, 5254
C 7005, 893, 149, 8140
D 927, 360, 580, 127
E 2645, 6597, 946
F 198, 767, 407, 814
G 6015, 3421, 6100
H 4899, 2743, 7618
I 865, 177, 381

Test 5

A $8562 - 3904 = n$
B $1275 - 1148 = n$
C $15482 - 2960 = n$
D $4755 - 809 = n$
E $8600 - 4678 = n$
F $37002 - 23546 = n$
G $42341 - 1897 = n$
H $69164 - 35251 = n$
I $83923 - 9789 = n$
J $76503 - 5772 = n$

Test 6

A $6 \times 492 = n$
B $9 \times 8741 = n$
C $95 \times 7 = n$
D $4 \times 563 = n$
E $166 \times 8 = n$
F $5 \times 780 = n$
G $3 \times 4679 = n$
H $6 \times 9047 = n$
I $7 \times 3210 = n$
J $9 \times 1097 = n$

Test 7

A $74 \times 369 = n$
B $810 \times 856 = n$
C $492 \times 983 = n$
D $98 \times 1178 = n$
E $508 \times 604 = n$
F $166 \times 895 = n$
G $79 \times 4032 = n$
H $560 \times 974 = n$
I $283 \times 362 = n$
J $647 \times 798 = n$

Test 8

A $786 \div 6 = n$
B $265 \div 8 = n$
C $903 \div 7 = n$
D $570 \div 5 = n$
E $847 \div 9 = n$
F $426 \div 8 = n$
G $619 \div 6 = n$
H $3982 \div 4 = n$
I $840 \div 3 = n$
J $2077 \div 7 = n$

Test 9

A $5751 \div 27 = n$
B $8973 \div 64 = n$
C $605 \div 13 = n$
D $6450 \div 215 = n$
E $9184 \div 120 = n$
F $58752 \div 192 = n$
G $39092 \div 58 = n$
H $4992 \div 223 = n$
I $48414 \div 406 = n$
J $16544 \div 32 = n$

Test 10

A $3462 + 8789 = n$

B $6918 - 579 = n$

C $n - 2347 = 4002$

D $986 + n = 1357$

E $4291 - n = 83$

F $n + 5634 = 6783$

G $8010 - n = 3756$

H $n + 1369 = 4910$

I $5472 + 3260 = n$

J $n - 1855 = 6274$

Test 11

A $n \times 36 = 972$

B $6484 \div 245 = n$

C $5875 \div n = 47$

D $706 \times n = 4236$

E $590 \times 718 = n$

F $9240 \div n = 440$

G $n \times 342 = 5814$

H $7811 \div 37 = n$

I $1291 \times 65 = n$

J $59 \times n = 24072$

Test 12

Find the sum.

A $\frac{3}{4}, \frac{1}{3}$

B $\frac{7}{12}, \frac{5}{12}$

C $\frac{5}{16}, \frac{1}{4}$

D $\frac{3}{10}, \frac{3}{5}$

E $\frac{1}{2}, \frac{2}{3}, \frac{5}{6}$

F $\frac{7}{8}, \frac{5}{6}, \frac{3}{4}, \frac{1}{2}$

G $\frac{3}{5}, \frac{1}{3}, \frac{2}{3}, \frac{4}{5}$

H $\frac{5}{12}, \frac{1}{2}, \frac{5}{6}$

Test 13

A $2\frac{3}{8} + 6\frac{5}{8} = n$

B $14\frac{2}{3} + 12\frac{4}{5} = n$

C $17\frac{1}{2} + 5\frac{1}{3} = n$

D $25\frac{7}{8} + 10\frac{15}{16} = n$

E $8\frac{3}{4} + 6\frac{5}{6} = n$

F $9\frac{9}{10} + 4\frac{3}{5} = n$

G $5\frac{1}{3} + 8\frac{1}{4} + \frac{11}{12} = n$

H $\frac{7}{10} + 32\frac{1}{2} + 1\frac{4}{5} = n$

I $12\frac{7}{12} + \frac{1}{6} + 32\frac{1}{2} = n$

Test 14

A $\frac{3}{4} - \frac{1}{3} = n$

B $\frac{7}{8} - \frac{1}{2} = n$

C $\frac{9}{10} - \frac{1}{2} = n$

D $\frac{11}{12} - \frac{3}{8} = n$

E $\frac{5}{6} - \frac{5}{12} = n$

F $\frac{3}{4} - \frac{1}{6} = n$

G $\frac{4}{5} - \frac{2}{3} = n$

H $\frac{1}{3} - \frac{1}{8} = n$

I $\frac{5}{6} - \frac{3}{8} = n$

Test 15

A $5\frac{7}{8} - 2\frac{3}{4} = n$

B $21\frac{4}{5} - 18\frac{2}{3} = n$

C $15\frac{2}{3} - 7\frac{5}{6} = n$

D $10\frac{3}{10} - 9\frac{4}{5} = n$

E $27\frac{1}{8} - 6\frac{7}{12} = n$

F $32 - 18\frac{9}{16} = n$

G $12\frac{5}{8} - 4\frac{5}{8} = n$

H $21\frac{13}{16} - 11\frac{3}{16} = n$

I $37\frac{1}{10} - 13\frac{3}{5} = n$

Test 16

A $17\frac{2}{3} + 5\frac{3}{4} = n$

B $n - \frac{1}{8} = 7\frac{1}{2}$

C $4\frac{1}{5} - n = 3\frac{1}{3}$

D $27\frac{5}{6} + n = 39\frac{1}{2}$

E $n + 3\frac{9}{10} = 12\frac{1}{4}$

F $\frac{5}{6} - \frac{5}{8} = n$

G $\frac{11}{12} - n = \frac{3}{8}$

H $n - 3\frac{2}{5} = 7\frac{3}{5}$

Test 17

A $93 \times \$1.87 = n$

B $\$4.25 + \$.18 = n$

C $\$17.86 + \$49.45 = n$

D $\$94.17 - \$8.92 = n$

E $\$52.50 \div \$.25 = n$

F $63 \times \$.97 = n$

G $\$816.18 - \$148.65 = n$

H $\$28.08 \div \$.72 = n$

I $46 \times \$2.54 = n$

Test 18

A 24 qt. = ▒ pt.

B 27 bu. = ▒ pk.

C 144 things = ▒ doz.

D 15 sq. yd. = ▒ sq. ft.

E 92 da. = ▒ hr.

F 432 sq. in. = ▒ sq. ft.

G 69 ft. = ▒ yd.

H 64 fl. oz. = ▒ c.

I 13 T. = ▒ lb.

Table of contents

This chart shows the organization of the arithmetic content of this book and indicates the kinds of social interests included in the pictures and problems. The book has been organized to keep the subject matter of arithmetic the center of the child's interest. Social material of interest to the child is contained in the pictures and verbal problems. The child's own social interests and experiences are brought to the book through these pictures and problems.

pages	skills and concepts	social interest
3-7	Measurement: concepts of shapes and dimensions	Observing surroundings
8-11	Measurement: introduction to meaning of area; square inch	Observing surroundings
12-15	Number system: reading and writing numbers through millions; regrouping for carrying and borrowing (reteaching)	School supplies
16-17	Roman numerals through thousands	
19-22	Problem solving: use of equation; review of previously taught problem types solved by addition and subtraction	Back to school
23	Useful approximations	
24-26	Problem solving: review of previously taught problem types solved by multiplication and division	Helping at home
27-30	Multiplication: basic facts with products of 40 to 81 (reteaching)	A Halloween party
31-36	Division: basic facts with dividends from 40 to 81 (reteaching)	Enjoying hobbies
37-38	Division: remainders (reteaching)	Enjoying hobbies
40-42	Problem solving: finding how many there were at first when the number gone and the number left are known (reteaching)	Caring for pets
43-45	Problem solving: finding how many are gone when the number to begin with and the number remaining are known (reteaching)	Enjoying hobbies
47	Multiplication: of numbers in which all figures but one are zeros (reteaching)	
48-52	Multiplication: 2-figure number by 1-figure multiplier (reteaching)	A school party
53-59	Multiplication: 3-figure number by 1-figure multiplier (reteaching)	School supplies
60	Multiplication: multipliers ending in zero (reteaching)	
61-64	Multiplication: 2-figure multiplier (reteaching)	The girls' club
67	Distinction between counting and measuring	Home activities
68-74	Division: 1-figure divisor, 2-figure quotient (reteaching)	A toy fair
77	Division: choosing the best quotient	
78-84	Division: 2-figure divisor, 2-figure quotient	Home activities
86-88	Division: with numerals expressing money	Earning and spending money
91	Division: choosing the best quotient	
92-95	Measurement: equivalents and reduction; tables of measures; abbreviations (reteaching)	Things around us
96-100	Problem solving: multiple-step problems	A fishing trip
101-104	Problem solving: finding the average	The boys' club
105-106	Problem solving: developing judgment in how to use the remainder in division	Everyday activities
107-109	Geometric figures: finding perimeters	Observing surroundings
112-117	Rate: meaning of; expressing rates	Buying at the neighborhood store
118	Order of terms in a ratio	Things around us
119-123	Comparison: meaning of; expressing comparisons	Toys and hobbies
126-131	Fractions: meaning of proper fractions; reading and writing (reteaching and extension)	School activities
132-133	Distinguishing among fractions, rates, and comparisons	Everyday activities
136-137	Learning that dividing or multiplying the dividend and divisor by the same number does not change the quotient; choosing a common divisor	
138-139	Problem solving: multiplicative problems in which the size of the equal groups or the number of equal groups is unknown	Home activities
140-142	Ratios: reduction of; finding the unknown term	Things around us
143-146	Fractions: reduction of; changing a fraction to another fraction with a specified denominator or numerator	Things around us
146	Largest common divisor; simplest form	
147	Profit and loss	A school fair

pages	skills and concepts	social interest
148-150	Fractions: meaning of improper fractions and mixed numbers; reading and writing (reteaching and extension)	Things around us
151-153	Reduction of improper fractions	Home activities
156	Mental calculating: addition and subtraction	
157	Geometric figures: extension of ideas of area and perimeter	
158-159	Fractions: comparison by means of a number line	
160-162	Fractions: finding a common denominator; comparison	
165-168	Fractions: introduction to addition and subtraction; extending use of common denominator	Things around us
170	Generalizations about size of fractions	
171-176	Addition of proper fractions	Home activities
177-182	Addition of mixed numbers	Home activities
183-184	Problem solving: fractions used in addition situations	Everyday activities
184	Short cuts in addition of fractions	
185	Changing mixed numbers to other equivalent forms (preparation for borrowing in subtraction)	
186-189	Subtraction of proper fractions	Home activities
190-195	Subtraction of mixed numbers	Home activities
196-197	Problem solving: fractions used in subtraction situations	Everyday activities
198-199	Measurement: reading and writing time; time zones; 24-hr. method of telling time	Observing surroundings
200	Mental calculating: multiplication	
204	Rounding numbers: preparation for estimating quotients	
205-206	Division: use of rounding techniques in estimating quotients	
207-208	Problem solving: fractions in comparison situations; finding the difference	Everyday activities
210-212	Division: expressing the quotient with a fraction when there is a remainder	Home activities
213-214	Developing judgment about the remainder in division	Everyday activities
215-220	Problem solving: using ratios in equations to solve rate problems	Home and school activities
221-226	Problem solving: using ratios in equations to solve comparison problems	Everyday activities
227-230	Problem solving: comparison expressed by "times as many"	Hobbies and everyday activities
232-233	Scale drawing: interpreting linear scales	Observing surroundings
234-237	Graphs: introduction to pictographs and bar graphs	Everyday statistics
238-239	Measurement: extension of ideas of perimeter and area	Observing shapes and forms
240-244	Measurement: computing the area of rectangles	Observing surroundings
245-248	Measurement: square foot, square yard; equivalents; reduction	Observing surroundings
249-250	Measurement: acre, square mile	Observing surroundings
250-251	Geometric figures: area as independent of perimeter	Observing shapes and forms
252-253	Per cents: reading and writing; comparing	School activities
255-256	Decimals: reading and writing to hundredths; comparing	Things around us
260-263	Review	
264-267	Evaluation	

Headings

Learning how
Lessons using the four-step teaching method to develop or reteach computational skills

Moving forward
Lessons developing other new material, including fractions, measurement, concept of rate, concept of comparison, scale drawing, and graphs

Exploring problems
Lessons developing specific problem-solving techniques

Using arithmetic
Maintenance and practice in solving verbal problems

Keeping skillful
Maintenance and practice in computation with whole numbers and fractions; in reduction of measures

Checking up
Tests of various types: inventory, achievement, diagnostic (end-of-block), and problem-solving

Thinking straight
Lessons involving special aspects of quantitative thinking

Looking back
Lessons involving reteaching or review of previously taught skills

Side trip
Lessons on various topics related to the arithmetic program: Roman numerals, time zones, 24-hour method of telling time

Summary of mathematical content

Numerals and the number system
- Reading and writing numerals through millions (reteaching)
- Place value through millions (reteaching)
- Regrouping as required in carrying and borrowing (reteaching)
- Roman numerals (reteaching and extension)
- Rounding off numbers (reteaching and extension)
- Fraction numerals (reteaching and extension)
- Ratios
- Decimal fraction numerals—tenths, hundredths
- Per cent symbols

Addition
- Addition of whole numbers (diagnosis)
- Addition of numbers representing money (diagnosis)
- Mental calculation (reteaching)
- Addition of proper fractions and mixed numbers

Subtraction
- Subtraction of whole numbers (diagnosis)
- Subtraction of numbers representing money (diagnosis)
- Mental calculation (reteaching)
- Subtraction of proper fractions and mixed numbers

Multiplication of whole numbers
- Basic facts, products of 36 and less (diagnosis)
- Basic facts, products 40 to 81 (reteaching)
- Multiplication of two-figure and three-figure numbers by one-figure multiplier (reteaching)
- Multiplication of two-figure and three-figure numbers by two-figure multiplier (reteaching)
- Multiplication by three-figure multiplier
- Mental calculation involving two-figure multiplicand and one-figure multiplier
- Multiplication of numbers representing money (reteaching)

Division of whole numbers
- Basic facts, dividends of 36 and less (diagnosis)
- Basic facts, dividends 40 to 81 (reteaching)
- Division by one-figure divisor (reteaching)
- Division by two-figure divisor
- Division by three-figure divisor
- Division involving numbers representing money
- Remainders in division (reteaching and extension)
- Estimating partial quotients

Measurement
- Measurement equivalents—liquid, temperature, dry, counting, time (clock, calendar), length, weight (reteaching)
- Reduction of measures (reteaching)
- Measures of area—square inch, square foot, square yard, acre, square mile

Money
- Addition and subtraction (diagnosis)
- Multiplication and division (reteaching)

Graphs and scale drawings
- Pictographs and bar graphs
- Interpreting linear scale on scale drawings

Fractions
- Concept of fractions (reteaching and extension)
- Improper fractions and mixed numbers (reteaching and extension)
- Addition of proper fractions and mixed numbers
- Subtraction of proper fractions and mixed numbers
- Reduction
- Comparison of fractions
- Using the remainder in division to make a fraction

Ratios
- Ratios as expressions of rate
- Ratios as expressions of comparison
- Reduction of ratios

Geometry
- Parallel lines and right angles (reteaching)
- Recognition of polygons and circle (reteaching and extension)
- Using dimensions to describe polygons and circles
- Scale drawing
- Concept of area
- Measurement of area—rectangles
- Measurement of perimeter—polygons

Problem solving
- Review and reteaching of all previously taught problem types
- Problems involving division of numbers representing dollars and cents
- Multiple-step problems
- Finding the average (reteaching and extension)
- Treating the remainder resulting from division
- Multiplicative problems in which the number of equal groups is unknown
- Multiplicative problems in which the size of the equal groups is unknown
- Using fractions in problem situations involving addition and subtraction
- Using fractions in comparison situations
- Using ratios to solve problems involving rate
- Using ratios to solve problems involving comparison
- Using comparison expressed as "times as many" in problem solving

Vocabulary

Seeing Through Arithmetic, Book 5, contains 978 different words. The complete list of words is in the *Teaching Guide*. Of the 978 words total vocabulary, 658 were used in the preceding books of this program. Children who have completed The New Basic Reading Program of the Curriculum Foundation Series, through the new *More Times and Places* (4^2), will be familiar with 207 of the 320 words not used in the preceding books of this program. For these children, only 113 words will be new in this book. Of these 113 words, 41 are used in the new *Days and Deeds* (5^1) and in *More Days and Deeds* (5^2).

The following forms of known words are not counted as new: inflected forms made by adding or dropping the endings s, es, *ed, ing, n, en,* and *er, est* of comparison (including those forms made by changing *y* to *i* or *f* to v, by dropping the final e, or by doubling the final consonant in the root word); possessives; derivatives formed by adding the prefixes *dis-, fore-, im-, re-,* or un-, and the suffixes, *-en, -er, -ful, -ish, -less, -ly,* -ment, -ness, *-or, -ship,* -ward, or -y, and *-teen, -th,* or *-ty* of numerals; compounds made up of known words; contractions; nonsense words or syllables that represent sounds. Also, homographs are not counted as separate words; for example, if *pen* meaning "a writing instrument" has been introduced, pen meaning "an enclosure" is not counted as new.

Index

Achievement tests, see Tests, achievement
Acre, 249-250
Addition
  of fractions, 165-168, 171-176, 177-182, 184
  inventory tests on, 18
  mental computation, 156
  practice, see Practice
Approximating, 23, 105-106, 204, 205-206, 213-214
Area, see also Measurement
  computing area of a rectangle, 240-244, 245-248, 249-250
  concept of, 8-11, 157, 238-239, 240-244, 245-248, 249-250, 250-251
  practice, see Practice
Average, finding, 101-104
Basic facts
  diagnostic tests in (products and dividends to 36), 18
  division (dividends 40 through 81), 31-36
  multiplication (products 40 through 81), 27-30
  practice, see Practice
Borrowing
  regrouping of mixed numbers for, 185
  regrouping of whole numbers for, 14-15
  in subtraction of fractions, 190-195
Carrying
  in addition of fractions, 171-176
  regrouping of whole numbers for, 14-15
Checking up, 18, 39, 66, 90, 110, 111, 155, 197, 201-202, 254, 264-267
Circle, 3-7
Common denominator, 158-159, 160-162, 165-168, 169
Commutative law, 60
Comparison
  of decimals, 255-256
  differentiated from fraction and rate, 132-133
  expressed by ratios, 119-123, 221-226, 227-230
  of fractions, 158-159, 160-162, 169, 170
  in problem solving, 221-226, 227-230
  of rates expressed by per cents, 252-253
Comparison, involving ideas of more, less, fewer, difference, 158-159, 160-162, 169, 170, 207-208, 234-237, 255-256
Decimal fraction numerals, 255-256, 260
Diagnostic tests, see Tests, End-of-block
Difference, 207-208
Dimensions of polygons, 3-7, 107-109, 238-239, 250-251
Distributive law, 200
Divisibility, tests for, 136-137
Division
  basic facts 40 through 81 (reteaching), 31-36
  choosing common divisor, 136-137
  estimating partial quotient, 77, 91, 204, 205-206
  inventory tests on basic facts with dividends of 36 or less, 18
  of money, 86-88
  1-figure divisor (reteaching), 68-74, 77
  2-figure divisor, 78-84, 86-88
  3-figure divisor, 203
  remainder in, 37-38, 105-106, 210-212, 213-214
  zero in, 204, 205-206
  practice, see Practice
End-of-block tests, see Tests
Equations, see also Exploring problems
  making, 19-22, 24-26, 40-42, 43-45, 86-88, 96-100, 101-104, 138-139, 183-184, 196-197,215-220, 221-226, 227-230, 240-244
  n, use of, 19-22, 24-26, 96-100, 138-139, 215-220, 221-226, 227-230, 240-244
Exploring problems, 19-22, 24-26, 40-42, 43-45, 86-88, 96-100, 101-104, 138-139, 213-214, 215-220, 221-226, 227-230, 240-244
Four-step teaching method, 48-52, 53-59, 61-64, 68-74, 78-84, 171-176, 177-182, 186-189, 190-195
Fractions and fraction numerals
  addition of, 165-168, 171-176, 177-182, 184
  common denominator, 158-159, 160-162, 165-168, 169
  comparison of, 158-159, 160-162, 169, 170
  distinguishing between fraction numerals and ratios, 132-133
  equivalent, 126-131, 143-146, 158-159, 160-162, 165-168, 185, 255-256
  to express remainder in division, 210-212, 213-214
  expressed as decimals, 255-256
  improper, meaning of, 148-150
  meaning of, 126-131, 148-150, 158-159, 160-162, 185
  mixed numbers, meaning of, 148-150, 185
  number line for comparing, 158-159
  in problem solving, 183-184, 196-197
  proper, meaning of, 126-131
  reduction of fraction numerals, 143-146, 151-153, 185
  simplest form, 146
  subtraction of, 165-168, 186-189, 190-195
  practice, see Practice
Geometry
  dimensions of polygons and circle, 3-7
  labels, 6-7, 36, 107-109, 250-251
  parallel lines, 5-7, 36, 107-108
  perpendicular, 5-7, 36
  right angle, 5-7, 36, 107-108
  understanding shapes and dimensions, 3-7, 107-109, 250-251
Graphs, 234-237
Improper fractions, see also Fractions
  meaning of, 148-150, 151-153
Keeping skillful, 23, 39, 45, 76, 77, 85, 91, 95, 125, 135, 142, 162, 164, 169, 182, 189, 203, 208, 209, 212, 231, 233, 237, 239, 253, 254, 258
Learning how, 48-52, 53-59, 61-64, 68-74, 78-84, 171-176, 177-182, 186-189, 190-195
Long division, see Division
Looking back, 12-15, 27-30, 31-36, 37-38, 47, 60, 92-95, 260, 261, 262, 263
Measurement, see also Geometry
  approximations in, 8-11
  equivalents, 92-95, 245-248, 249-250
  linear, 5-7, 92-95, 107-109
  measures of time, 92-95, 198-199
  reduction in, 92-95, 245-248
  square measure, 8-11, 157, 238-239, 240-244, 245-248, 249-250
  standard time and time zones, 198-199
  tables of measure, 93
  practice, see Practice
Measuring units vs. counting units, 67
Mental computation, 156, 200
Mixed numbers, see also Fractions
  meaning of, 148-150, 185
Money
  division of, 86-88
  inventory tests on addition and subtraction, 18
  multiplication of, 64, 164
Moving forward, 3-7, 8-11, 107-109, 112-117, 119-123, 126-131, 140-142, 143-146, 148-150, 151-153, 158-159, 160-162, 165-168, 185, 210-212, 232-233, 234-237, 245-248, 252-253, 255-256
Multiple-step problems, 96-100, 101-104
Multiplication
  basic facts from 40-81 (reteaching), 27-30
  inventory tests on basic facts with products of 36 or less, 18
  mental computation, 200
  1-figure multiplier (reteaching and extension), 47, 48-52, 53-59, 164
  2-figure multiplier (reteaching and extension), 60, 61-64, 164
  3-figure multiplier, 77
  practice, see Practice

N, use of in equations, 19-22, 24-26, 96-100, 138-139, 215-220, 221-226, 227-230, 240-244
Numbers, see also Numerals
even and odd, 136-137
rounding off, 23, 204
use of for approximations, 23, 105-106, 204, 205-206, 213-214
Number line, 158-159, 255-256
Number pairs, see Fractions, Ratio
Number system
fractions in, 158-159
place value through millions (review), 12-15, 260
reading and writing numbers from 2 to 9 places (review), 12-15, 260
regrouping of mixed numbers in, 185
regrouping of whole numbers in, 14-15
zero as a place holder, 12-15, 47, 60
Numerals
decimal fraction numeral, meaning of, 255-256
fraction, meaning of, 126-131
reading and writing, through millions, 12-15
Roman, 16-17
Parallel lines, 5-7, 36, 107-109
Per cents, introduction to, 252-253
Perimeter
computing, 107-109
concept of, 107-109
relationship to area, 238-239, 250-251
Perpendicular, 5-7, 36
Place value, review of, through millions, 12-15, 260
Polygon
area of, restricted to rectangle, 8-11, 157, 238-239, 240-244, 245-248, 249-250, 250-251
concept of, 3-7, 107-109, 157, 250-251
perimeter of, 107-109, 157
Practice
addition of fractions, 176, 182, 184, 189, 197, 202, 203, 208, 212, 231, 233, 239, 253, 254, 267
basic facts, 18, 23, 28, 30, 33, 36, 38, 39
finding areas, 244, 248, 250, 254, 262
interpretation of ratios, 117, 118, 122-123, 133
reduction of fraction numerals, 145, 146, 153, 155, 162, 169, 261
reduction of measures, 95, 111, 125, 169, 203, 212, 231, 248, 254, 258, 262, 267
reduction of ratios, 142, 155, 202, 209, 231, 233
subtraction of fractions, 189, 195, 197, 202, 203, 208, 231, 233, 239, 253, 254, 267
Practice, continued
whole numbers (4 processes), 18, 23, 39, 45, 52, 59, 64, 66, 74, 76, 77, 84, 85, 90, 91, 95, 111, 125, 135, 142, 156, 162, 164, 169, 182, 189, 200, 202, 203, 204, 206, 208, 211, 212, 231, 233, 237, 254, 258, 266, 267
Problems (verbal), 19, 22, 26, 42, 44-45, 46-47, 65-66, 75-76, 84-85, 88, 89-90, 100, 104, 110, 124-125, 134-135, 154-155, 163-164, 183-184, 196-197, 201, 207-208, 213-214, 219-220, 225-226, 230, 244, 248, 249-250, 257-258, 264-265
Problem solving
finding the average, 101-104
finding the difference, 207-208
finding how many are gone (reteaching), 43-45
finding how many there were when the number gone and the number left are known (reteaching), 40-42
finding how many times as many, 227-230
multiple-step problems, 96-100, 101-104
multiplicative problems in which the number of equal groups or the size of the equal groups is unknown, 138-139
n, use of in equations, 19-22, 24-26, 96-100, 138-139, 215-220, 221-226, 227-230, 240-244
remainder in, 105-106, 213-214
review of previously taught problem types, 19-22, 24-26
tests on, 110, 201, 264-265
using comparison in, 21-22, 207-208, 221-226, 227-230
using fractions in problem situations, 183-184, 196-197, 207-208, 213-214
using rate in, 215-220, 240-244
Problem tests, see Tests
Profit and loss, 147, 259
Quotients
estimating partial, 77, 91, 204, 205-206
expressing remainders as fractions in, 210-212, 213-214
Rate
concept of, 112-117, 118
differentiated from fraction and comparison, 132-133
expressed by per cent, 252-253
expressed by ratio, 112-117, 118, 215-220
used in problem solving, 215-220, 240-244
used to find area, 240-244, 245-248
Ratio
and per cent, 252-253
differentiated from fraction numeral, 132-133
to express comparison, 119-123, 221-226, 227-230
Ratio, continued
to express rate, 112-117, 118, 215-220
numeral 1 as second term, 118, 227-230, 240-244, 245-248
reduction of, 140-142
used in equations, 215-220, 221-226, 227-230, 240-244
Rectangle
area of, 8-11, 157, 238-239, 240-244, 245-248, 249-250, 250-251
concept of, 3-7, 107-109, 157
perimeter of, 107-109, 157, 238-239, 250-251
Reduction
of fractions, 143-146, 151-153
of measures, 92-95, 245-248
of mixed numbers, 185
of ratios, 140-142
Remainders in division, 37-38, 105-106, 210-212, 213-214
Roman numerals, 16-17
Rounding off numbers, 23, 105-106, 204, 205-206, 213-214
Scale and scale drawings, 232-233, 234-237
Short cuts, 47, 60, 136-137, 156, 184, 200, 204, 205-206
Side trip, 16-17, 198-199
Square, see Rectangle
Square measures, 8-11, 157, 238-239, 240-244, 245-248, 249-250, 250-251
Subtraction
inventory tests on, 18
of fractions, 165-168, 186-189, 190-195
mental computation, 156
practice, see Practice
Tests
achievement, 110, 111, 201-202, 264-267
computation, 18, 66, 90, 111, 197, 202, 254, 266, 267
End-of-block (diagnostic), 18, 39, 66, 90, 155, 197, 254
problem solving, 110, 201, 264, 265
Thinking straight, 23, 36, 67, 77, 105-106, 118, 132-133, 136-137, 146, 147, 156, 157, 170, 184, 200, 204, 205-206, 238-239, 250-251, 259
Time, 198-199
"Times as many," 227-230
Triangle
concept of, 3-7, 107-109, 157, 250-251
perimeter of, 107-109
Using arithmetic, 46-47, 65-66, 75-76, 84-85, 89-90, 124-125, 134-135, 154-155, 163-164, 183-184, 196-197, 207-208, 249-250, 257-258
Verbal problems, see Problems, verbal
Zero, 12-14, 47, 60, 204, 205-206, 232-233, 234-237

QA 135 H332 1964 BK=5
SEEING THROUGH ARITHMETIC

40030981 CURR HIST

000031416100

Date Due

NOV 7 '69
DEC 2 '69
DEC 2 '69
FEB 13 '70
MAR 7 RETURN
RETD. MAY 8 1971
RETD. MAY 18 1971

EDUCATION

Amount Jane had at first

Amount she spent

Amount left

$5.00 − $3.89 = n

You must find this number.

Scott, Foresman